The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXVIII. April 29, 1933 No. 722

Notes and Comments

Laboratory Equipment

AN industrial laboratory is in no sense a standardised part of any works—"such and so various are the tastes of men." The research laboratory is a law unto itself, to that we make no reference other than to stress the necessity for the provision of instruments of the highest precision capable of making accurately the most delicate measurements and to pay a tribute to British instrument makers who can now fulfil the most exacting demands. The works laboratory may vary from the wonderfully kept and equipped building reminiscent of the University, to the dark little room in an odd corner of the boiler house where all beakers and open dishes must at once be covered lest they be heavily contaminated with a layer of coal-dust, and where occasionally the chemist has to work with unpurified gas and to battle with the choking fumes of the sulphur dioxide arising therefrom. We have seen such laboratories or we should not dare to write about them, lest we be disbelieved.

The works frequently depends for the purity of its products upon the skill and the analytical results of its chemists. It is usually impossible to produce products of a consistent and saleable quality unless frequent chemical analyses are made during the process of manufacture and upon the finished product; the avoidance of waste necessitates accurate analytical knowledge of what is occurring. The chemist must be encouraged to keep his high ideals of accuracy and precision. None of these things are possible in an ill-equipped laboratory. To many the laboratory may seem to be an insignificant and even costly part of the works, but in reality it is a potent nerve-cell which cannot function properly unless well-nourished. It is because of its importance that we make a special feature of laboratory equipment in this issue.

The Budget

IF, like the politicians, we could dismiss with a light heart the possibilities of economy, there is really little serious criticism to make of the Budget introduced by Mr. Neville Chamberlain on Tuesday. Indeed, the Chancellor is to be congratulated on keeping as closely to the rules of sound finance as is possible in all the unsound circumstances of the moment. The business classes will be relieved that he has had the courage to ignore all the bad advice of the inflationists and other soft money mongers. They have vivid and unpleasant recollections of the flight from the pound. They alone realise the gravity of the dangers from which we have escaped, and they will, therefore, be thankful that taxes are not to be reduced by borrowing. The Budget emphasises once again the folly of making suggestions to the Chancellor of the Exchequer. All history shows that Chancellors only accept that part of a suggestion which happens to suit them. The irresponsible agitation for lower taxation coupled with borrowing has enabled Mr. Chamberlain to do a little borrowing without lowering the taxes. He abolishes the Sinking Fund, which in itself is the equivalent of borrowing. He appropriates the War Loan Depreciation Reserve of ten millions, and this again is equivalent to borrowing. He announces frankly his intention of adding last year's deficit of £32,000,000 to the floating debt, and together these items constitute a fairly considerable addition to the national liabilities.

This Budget perpetuates the practice of collecting into, and squandering through, the public purse something approaching half the national income. Whether the proportion be a third or a half, it is higher than ever before because Mr. Chamberlain expects a lower total income and budgets for the same amount of total taxation. We must not grudge the Chancellor full credit for the odd economies here and there upon which he was careful to dilate in his Budget speech. Business men are accustomed to hear a great deal about small economies in some departments as a way of covering up increases of expenditure in others. We are grateful for the economies, but they do not reduce the total bill. The Budget also continues the bad practice invented by Mr. Churchill of leaving out the self-balancing items. This difference vitiates all comparison with the figures of six or seven years ago, and 150 millions has to be added to the Budget figure in order to get its true relation to the pre-Churchill account.

A Financial Roll of Honour

THE most distressing things about the Budget statement are to be found in the inferences to be drawn from it. What greater economic tragedy, for instance, has been reported in recent years than the twelve thousand casualties among the surtax payers? This financial roll of honour in the battle between politics and trade, refers almost entirely to the middle and upper trading classes, men who just getting into their stride as useful captains and leaders of industry have reached the £2,000 a year mark and been driven back by extravagant public finance. If the full tale of struggle associated with these twelve thousand casualties could only be told, we should probably have all the truth required to explain the maintenance of the unemployment scourge. But the Budget almost callously passes over this story, and having in the year that is past failed to reach the income tax estimate by 8½ millions, announces almost as a matter of routine that there will be a further 11½ millions less from income tax

payers in the year that is to come. When it is remembered that the drop in the surtax and income tax receipts is far from commensurate with the drop in income, and that year by year new turns of the screw make the real burden higher and higher, the extent of the trouble is seen to be even greater.

Parliamentary finance is, of course, governed by political and not economic considerations, and thus we get a penny in the pint off beer. No attempt whatever is made to argue the matter on an economic basis. The folly of adding 10 per cent. to the surtax, as was done a year ago, was proved by the diminution in surtax receipts of £5,300,000. The folly of the added tax on beer is proved in exactly the same way by the operation of the same economic force. But there are votes in beer, and no such things worth mentioning in surtax, so beer is relieved and the surtax swindle is left alone, although the figures show that the 10 per cent. was a mistake from the Chancellor's own point of view.

A Spot of Cheer

SOMETHING like 40 millions has been taken out of the pockets of the middle class and the trading and commercial classes generally by the Conversion operation. This is claimed as economy. The consequent fall in the price of money has robbed these same people of an equal sum in the reduction of the rate of interest by county and corporation and all other big borrowers. Whereas the cost of the National Debt was roughly the same as the amount of income tax, and it was therefore argued that the whole business was merely transfer of income from one pocket to another by the same class, the cost of the debt has in ten years been reduced from 312 to 224 millions, while the amount of the income tax has steadily increased. This represents an enormous transfer of income from the trading and middle classes into the pockets of public servants, privileged wage earners and dole drawers, all of whom have received a steady rise in their real remuneration as the cost of living has gone down. It is impossible to hope for an improvement in the nation's position while this sort of process is allowed to continue.

We must be thankful for the permission to pay these intolerable burdens in two equal instalments. There is also a spot of cheer in the reduction of the duty on new capital issues from £1 to 10s., which seems to suggest some relaxation of Government restriction on new issues.

Construction and Reconstruction

WE believe that the chemical industry as a whole is fully alive to the necessity for continuing and extending its forward policy. The past years have seen a definite change in the orientation of salesmanship and that change must be taken into account when considering what form the forward policy should assume. Originally the user decided what product he required and then travelled round, personally or by letter, to discover who could supply his needs at a price that would suit his pocket. There are many occasions on which that is still the only possible procedure, even though the extensive use of advertising and other forms of publicity has simplified matters. To-day, however, there is a growing tendency for the manufacturer of a product to become more expert in the use of his goods than is the user himself. Whereas research was confined formerly to the production of new goods or to the discovery of new processes or to the improvement of old processes, it is now even more essential to investigate new uses for established goods and to open new markets. Scientific research, in short, has become also an adjunct to market research. This process can be seen happening in kindred industries as well as in the chemical industry. The Coal Utilisation Council, for example, has just been formed because coal is being used in less and less quantities, and unless former users are instructed in the best methods of working and new methods are devised coal will be increasingly supplanted by other forms of energy. Hitherto the mine-owners' coal research has been entirely confined to mining matters and the utilisation side of the industry has been held to be the concern of the user only—if the user did not make the best use of his fuel, what was that to the miner? As a result the gibe has been made publicly and with good reason that the coal owner is completely ignorant of the material he mines and markets. *Mais, nous avons changé tout cela.*

A Favourable Opportunity

THIS practice is more difficult to apply in the chemical industry, because the use for chemicals is not so " clear-cut " as for coal and gas, and moreover there is more of an element of secrecy in the chemical works than in many other industries. Most chemical products, however, are not used wholly or even largely by the industry itself, and in this direction lies a wide field for research. When considering its policy for the future, the chemical industry must be prepared to extend its research activities so that the research laboratory of the future will become the ally of the salesman to an even greater extent than it will be the ally of the production engineer. This will largely increase expenditure, but it will also make the research laboratory more obviously a revenue-producing department than it appears to be to the uninitiated.

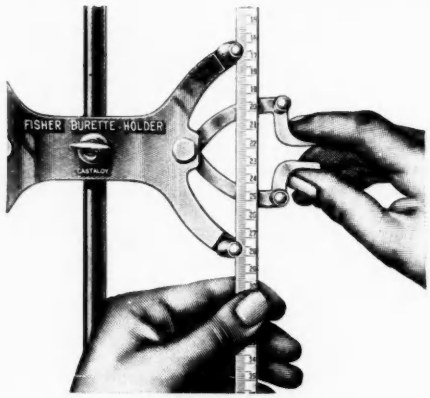
One result of the adoption of this policy can be seen in the fact that the gas industry has passed through the greatest depression of our times without losing ground—probably no other industry can say as much. The chemical industry, however, can claim that it has been less hit than most industries. Nevertheless, trade has been reduced, plant has been idle, and much that was out-of-date has not been renewed. The steady revival of trade that we expect, coupled with a forward policy in regard to salesmanship, must result in greatly increased uses for chemical products. The plastic industry, may be instanced as one in which this policy might lead to an almost unbelievable expansion. Is the chemical industry prepared to take advantage of this expansion when it comes? There must be many chemical works up and down the country that are in urgent need of overhauling. There are old plants due for scrapping that can no longer work efficiently; there are new plants that should have been built but that have been postponed. Are our chemical works at their highest peak of efficiency and of a sufficient size to take advantage of the increased demands with which they will certainly be faced in the future? We ask this more particularly because so much depends on the capital cost of plant. This factor alone may determine the economic success or failure of a new process. Prices are now at their lowest; labour is plentiful. Could not the far-seeing take this favourable opportunity of preparing for the future?

Some Points on General Laboratory Equipment

How the Laboratory Furnishers are Assisting the Chemist

This article has been written by a technical member of the staff of Griffin and Tatlock, Ltd., to whom we are indebted for the illustrations which are given.

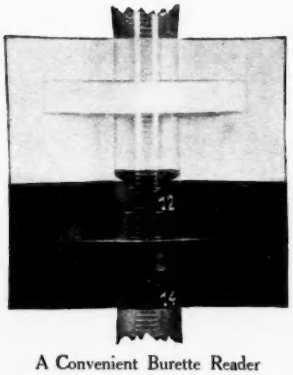
It needs no very great discernment to see what the chemist, the metallurgist, the physicist, and what science in general has accomplished in the last decade or two. The chemist in the dye industry, placed in a favourable position by the Dyestuffs Act, has been able to supply most of the requirements of dye users which were hitherto fulfilled chiefly by goods of foreign production. The metallurgist has made great strides in the production of new alloys which have found extensive application in all industries and have contributed to successes apparently remote from the field of metallurgy, such as the world's speed records now held by Great Britain. The



The Fisher Burette Clamp

physicist has, within the last ten years, raised a monument to himself in the great radio industry. It is therefore amply proven that pure research and laboratory control are vital considerations in every progressive industry, and it is now time that the industrialist rids himself of the idea that the laboratory is an "overhead charge." The laboratory is, or should be, if properly handled, a most fruitful source of revenue.

For the benefit of those who have not already a laboratory installed, it may advantageously be considered how best to choose the situation for and equip such a department, though



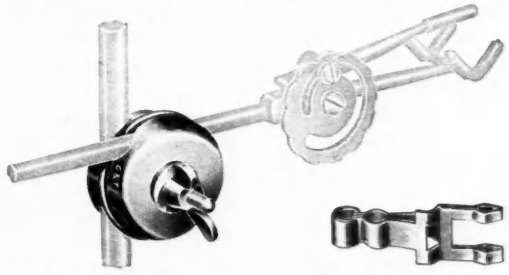
A Convenient Burette Reader

here the question can be considered only in outline, since the procedure will necessarily require to be adapted to the needs of each particular industry. In the first place, the laboratory should be a well-lighted room, illuminated as far as possible by daylight. For chemical laboratories a wooden or a cement floor is the most serviceable; linoleum and similar floor coverings are slippery when wet. A convenient bench height is 30-32 inches. The benches for general work—precipitations, wet tests, etc.—should have stout, plane, well waxed, teak tops and should be provided with cupboards and drawers. The top of the bench should overhang the front of the drawers by not less than 3 in.

Ample provision should be made for a supply of hot as well as cold water, a point often overlooked. For the former, if no works supply is available, one of the many patterns

The Fasgrif Clamp

of instantaneous heater, fitted with a by-pass, is quite satisfactory, while for cold water a swan-neck tap with taps for connection to condensers, specially designed for laboratory use is required. In the latter case, the tap should be fitted at such a height that there is space between it and the base of the sink for the insertion of a condenser. A good plan is to run a length of $\frac{1}{4}$ in. metal tubing along the bench and to provide it at three or four points with small, screw down valves and nozzles. Such a tube will carry sufficient water for many condensers and if the bench have a waste hole



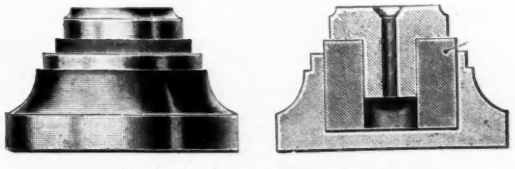
Universal Bosshead

"G. & T." Burette Clamp

beneath each valve, long rubber connections are eliminated and water is available wherever required.

The best form of gas fitting is undoubtedly that in which the gas connection is at the back of the bench and is controlled by that pattern of tap in which the lever moves round the pipe—not revolves at right angles to it—situated beneath the overhanging bench top.

The question of reagent shelves is one largely of personal taste. Some prefer an opal glass plate at the back of the bench and abhor any form of supported shelf on the bench.



Shock Absorbers for Balance Case Feet

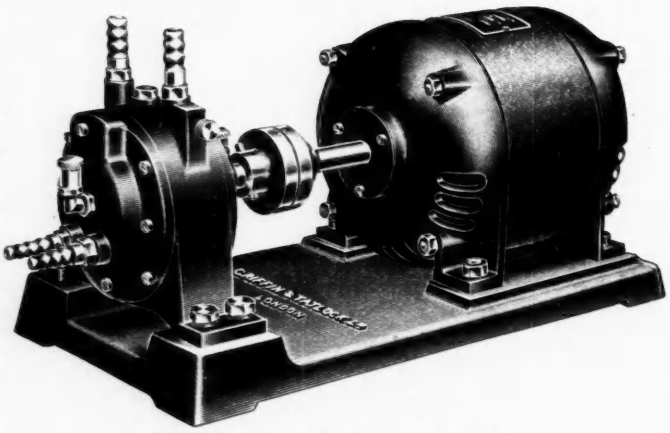
Others prefer to have reagents on shelves immediately at hand. Whatever situation is adopted the shelves should certainly be fitted with stout opal or plate glass bases so that they may easily be kept clean.

The situation of the bench is a matter of some importance and will be governed by the purpose for which it is to be used and the size of the laboratory. The position selected for benches for general work is not critical; the titration bench, far more important than others, is ideal if situated in front of a window with a northern aspect. Here an opal glass top is a great convenience and Schellbach burettes will facilitate

reading the burette, though one of the excellent cheap forms of burette reader, designed to eliminate the light reflected from the base of the meniscus, will be found useful. The great variety of burette holders makes selection somewhat difficult. One holder, here illustrated, is die-cast in white metal alloy and is convenient in operation. A second type supports the burette in spring jaws; it needs merely the pressure of the finger and thumb to release the burette and further, the latter can, when required, be made to slide easily in the jaws, bringing the meniscus at eye level, thus obviating the necessity for constant fumbling with clumsy wooden screws such as are fitted to the normal wooden burette stand.

In works where the laboratory is subject to much vibration the placing of the balance bench presents a problem. In any case it should have a heavy top, preferably of stone or slate, and be attached to the wall by means of substantial angle brackets. It should be rather lower than the chemical bench, say 26 to 28 in., so that when seated on a low stool the elbows are about level with the base-plate of the balance. This position is the one most comfortable and conducive to rapidity of weighing. To damp out or absorb vibrations in the balance due to disturbance by heavy machinery, the feet of the balance may be inserted in holes drilled in rubber stoppers about 1½ in. diameter, or alternatively, special shock absorbers may be used.

The fume cupboard need not be an elaborate structure, but care should be exercised in its construction. It should have a stone or slate base and there must be an outlet in the top by which noxious gases are drawn up, either by a flame or by a fan with stainless steel blades, and the gases so discharged into the outside atmosphere. The Kipps apparatus for H_2S is housed here, and there should also be a gas point inside the cupboard for combustions in which irritant gases are likely to be produced.



Laboratory Blower with Direct-coupled Motor.

A combustion bench is desirable where a muffle furnace, either gas or electric, can be placed. Here also can be placed the blowpipe for combustions requiring access of air and a higher temperature than can be attained with the Meker burner. The supply of air to a blowpipe can be conveniently arranged by means of a recently designed water cooled motor blower of a high standard of performance. This will deliver sufficient air to operate 8 to 10 blowpipes at an open circuit pressure of about 6 lb. per sq. in. and can be also used for vacuum (filtration, desiccators, etc.), to exhaust to a pressure of about 13 in. of mercury. Where a fan is fitted to the fume chamber, the disposal of gases generated in combustions at this bench is greatly simplified.

Facilities for washing dirty apparatus, in addition to those provided on the benches, must not be overlooked. The sink should be large and deep, fitted with both hot and cold water and have a draining board of which the most popular form is that fastened vertically to the wall and provided with pegs sloping upwards. For cleaning very dirty beakers, etc., fine sand is an excellent medium in conjunction with soapy water.

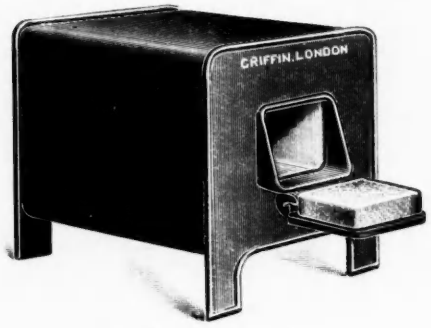
A New Design in Gas Taps

A Convenient Arrangement for Water Taps.

A New Design in Electrically-heated Ovens.

Another method, which, in view of its convenience, simplicity and efficacy deserves to be more widely adopted, is that of keeping near the sink a large, wide mouthed, glass specimen jar containing commercial concentrated sulphuric acid and potassium bichromate (chromic acid). Dirty and greasy apparatus may be plunged into this and left for some time then merely removed and rinsed. Stainless steel crucible tongs are used for the removal and, even if reserved for this purpose, have a quite lengthy life.

First aid and fire appliances should be installed in every laboratory. The type of first aid equipment is dictated chiefly by number of workers in the laboratory and one of the standard Home Office sets will be found suitable. Fire appliances



Electrically-heated Muffle

should include sand buckets, conveniently placed, and a reliable type of carbon tetrachloride extinguisher. The latter should never be used on fires caused by metallic sodium or potassium.

In some industries, for example, sugar, metallurgical, etc., it will be necessary to provide a dark room in the laboratory, for housing polarimeters and photomicrographic apparatus. Here the walls should be treated with absorbent, dead black covering. The new sodium vapour electric lamps will be found to provide a far steadier source of monochromatic light than the traditional bunsen, asbestos and sodium chloride.

Standard stainless steel weights of analytical quality have recently been marketed in attractive bakelite cases which will neither warp nor shrink. Each box of weights is sent out with a works certificate showing the error in each individual weight. Since the weights agree among themselves in the

Stainless Steel Weights in Bakelite Case

sense that the error in any combination of weights totalling the same as any given weight does not exceed the error in the given weight, the actual error is far less than would appear from an examination of the table of permissible error.

Clamps and bossheads for retort stands have been evolved from a cumbrous wooden prototype used by the early experimenters and have undergone but little improvement until the "Fasgrif" types were made available. This clamp utilises a remarkably simple principle in which a circular disc containing a helical track is attached to one jaw of the clamp and a small pin and roller running in the track, to the other jaw. Rotation of the cam opens and closes the jaws in a fraction of the time taken for the old right and left handed screw types. There is no danger of the cam slipping as resolution of the forces about the pin indicates that the tangential component acts always in a direction tending to close the jaws even more firmly. Further, the whole clamp is die-cast in an incorrodible alloy. The "Fasgrif" bosshead enables universal adjustment to be effected between any two rods; for example, the retort stand rod and the clamp stem. It is made in three sections, the centre one being merely a disc containing two similar pairs of "V" grooves. A stainless steel threaded stem is rivetted to one section, passes through the hole in the central disc, then through a hole in the top section and is there fitted with a butterfly nut and spherically seated washer. To use the bosshead the rods are merely inserted in the appropriate sized grooves in the respective sections and the one nut tightened. A universal system is thus secured enabling the rods to be adjusted with any angle between them.

The choice of suitable glassware will depend upon the purpose for which it is to be used. Certain types possess remarkable heat resistant properties, others, mechanical strength and others resistance to alkali. The last is probably not so important a consideration for most purposes as length of life. A suitable brand may readily be selected by reference to published specifications or according to the advice of the laboratory furnisher.

Electrically-heated apparatus such as water baths, ovens, extraction apparatus, hot plates, etc., offer great advantage over gas-heated types, particularly as their early unreliability has definitely been overcome. Ease of thermostatic control with no copper bottoms to be constantly replaced are points which should weigh heavily when choosing a suitable type. Where determinations of calorific value and moisture content have been carried out, bomb or other calorimeters and ovens, or one of the new forms of electric moisture testers will also be required.

Prevention of Mildew

A New Product of British Manufacture

A NEW and very powerful antiseptic and germicide has been introduced by A. Boake, Roberts and Co., Ltd. This liquid, placed on the market under the name of "Abracide," has an odour and taste slightly reminiscent of thymol. It has already proved to be of great use for preventing the growth of molds, and is also particularly active against pyogenic bacteria. A 5 per cent. solution in 10 per cent. soap solution is germicidal in dilutions of 1 : 300; in other words, Abracide not only stops the growth of molds but actually kills all the spores at the very high dilution of 1 : 6000. The new product is, therefore, recommended for use in glue and gelatine distempers, pastes, size, putty, adhesives, and any preparation containing casein, albumen, gums, starch or dextrine, as well as in the treatment of wallpaper and textiles. It has a great advantage over most other germicides in being stable in soap solutions. It also has a very weak acid character, whereas many other germicides are sufficiently acid to hydrolise soap and combine with the alkali, thereby lessening much of their germicidal value. As Abracide itself is not easily soluble in water (1 : 3000) it is generally used as a 5 per cent soap solution which should then be added at the rate of 1 : 250; alternatively, Abracide may be dissolved one part in four parts of industrial ethyl alcohol or isopropyl alcohol, and this concentrated solution added at the rate of 1 : 1000.

In preventing bacterial decomposition of tan liquors, tests using a mixed culture of *Mucor* and *Aspergillus* as test organisms, showed that Abracide not only completely inhibited the growth in dilutions up to 1 : 6000, but that subcultures after two days were also sterile. Both of these organisms are capable of producing decomposition and spoilage of leather goods, and it is therefore important that their growth should be prevented during the tanning processes. Another industrial application of importance will be found in the manufacture of cardboard. Here Abracide may be used to prevent the objectionable odour, due to mold formation, which frequently occurs in cardboard boxes when the size undergoes decomposition.

Bridging the Gap Between Laboratory and Works

By J. H. WEST, M.I.Chem.E.

MODERN research laboratories are interesting places even from the engineering point of view. There are so many gadgets now available which reproduce industrial apparatus in miniature, and enable factory conditions to be realised to an extent undreamed of in the laboratories of thirty or forty years ago, when practically all the apparatus was of glass or porcelain. This is certainly a great help in the development of new processes. The larger the scale on which the various unit operations can be tried out the more reliable and accurate will be the knowledge upon which the design of the ultimate large-scale plant can be based. If apparatus is available on which the final try-out can be made on a scale of not less than one-hundredth full size, most, if not all of the required information should be forthcoming. Even then the chemical engineer is by no means in the happy position of the ship designer, who can with absolute confidence bridge the gap between tiny models in the tank and the full-size ship.

Control of temperatures, whether we are heating or cooling, becomes of rapidly increasing difficulty in many cases as the unit gets bigger. For instance, it is quite easy to design a small vessel in which a catalytic reaction between gases or vapours can be carried out and kept within a fairly narrow optimum temperature range, but it is exceedingly difficult to design a satisfactory large unit of this kind. Among other operations with which unexpected difficulty may be experienced on large units, filtration and drying may be mentioned. Because you can filter a particular material quite easily and effectively in a 6 inch press or centrifugal with a $\frac{1}{4}$ in cake, it does not follow that you will be able to do so in a 36 inch apparatus with a correspondingly thicker cake. Similarly with drying; there are materials which behave quite nicely in small quantities weighing a few pounds, but become sullen and intractable when heaped in hundredweights or tons. If in any new process there is the slightest suspicion that the intermediate or final products may show these unpleasant characteristics in bulk, it is best to take no risk but accumulate enough of the material to try out a full-scale test of the doubtful operation, even if this means sending the sample to the plant maker.

Troubles due to Cumulative Action

There is another class of snag that may turn up sooner or later on the large plant, although quite unsuspected on the laboratory scale, due to what may be termed cumulative action. In many if not most processes, there are accumulations of low-grade intermediate products resulting from purification operations. For instance, if you are evaporating a liquor and taking off successive crops of crystals, your liquor will get fouler and fouler, until a final mother liquor is reached which probably has to be cleaned up before anything more can be got from it. Taking another case where you are fractionating a crude solvent to separate one or more final products from each other and from the remainder of the crude liquor, you will find that you rarely get clean cuts, but have to run intermediate fractions which must later themselves be refractionated, and so on almost indefinitely. In such cases, impurities present in the raw materials, or products of side reactions, so small in amount as to escape detection on the laboratory scale where their recovery or working-up stages are never reached, may appear in surprising quantities and cause trouble in various ways. For one thing it is often very difficult to know beforehand how many of these liquors, and how much of each there will be, and what storage should be provided for them. For another, their existence, besides complicating the business of stock-taking, may result in the yield of the process turning out substantially lower than was anticipated on the laboratory tests. A third source of trouble may arise in such cases, and also particularly in processes where a portion of the liquors is circulated round and round in a closed circuit for scrubbing or a like purpose. This is that some substance, such as a chloride, present in one of the raw materials to a negligible amount, may get trapped in the closed circuit and build up in quantity until capable of causing serious corrosion to the plant. Similarly in catalytic reactions the gas which is in excess may be circulated round and round over the catalyst after removal of the product, and some impurity may build up which ultimately reaches a concentration at which it rapidly poisons the catalyst.

The Optimum Scale of Operations

Turning from purely technical considerations, it is interesting to speculate on the relation between total cost of production and size of plant, and to wonder whether there is an optimum size of organisation beyond which costs increase. In the writer's opinion it is by no means certain that the larger the scale of operations the cheaper will be the product. It will depend so much on the efficiency of the organisation as to how far the savings natural to very large-scale working will be offset by increased overheads. The pity of it is that to-day many such questions of importance to the chemical industry remain a matter of guess-work, due to lack of investigation. Other industries have realised that it pays for firms to pool information so that definite answers to them can be worked out, but nothing can be done without co-operation, and the mentality and outlook of the average chemical manufacturer will have to change a great deal before we can expect progress on the lines now being achieved in the iron and steel industry.

Help for Coastwise Shipping

A Nine Points Plea to Manufacturers

ADMIRAL of the Fleet Earl Beatty, president of the Coastal Trade Development Council, and Sir John Sandeman Allen, M.P., chairman of its executive, have addressed to the Association of British Chemical Manufacturers, the Association of Manufacturing Chemists, the British Sulphate of Ammonia Federation, the National Sulphuric Acid Association, and other associations of manufacturers and traders a letter drawing attention to the advantages that will accrue to trade if greater use is made of coastwise shipping, and appealing to traders to give this form of transport their support.

The appeal is based on nine main points: (1) The indispensability of coastwise shipping (as the principal training-ground of the merchant navy) to the maintenance of our world shipping status; (2) the need for encouraging coastwise ships in time of peace if they are to be available in time of war; (3) the need for the recognition of coastwise shipping as a third arm of transport, both alternative and complementary to road and rail; (4) its relation to employment of sailors, stevedores, dock and warehouse hands, administrative staffs, and those engaged in the manufacture of ship's materials; (5) the fundamental and inherent economy of water transport; (6) the frequency, regularity and speed of coastal liner services and their ability to cater for "door-to-door" traffic; (7) the possibility of development in conjunction with inland waterways, which would bring direct sea access to inland towns and cities; (8) special appropriateness to the handling and carriage of loads which are either themselves susceptible to damage or are a cause of damage to road surfaces, bridges, drains and cables; and (9) relationship of coastwise traffic to the maintenance and prosperity of the ports and of the coastal industries which are dependent upon shipping for transport.

The letter points out that although coastwise shipping is one of the oldest industries of this country, none has kept itself more abreast of the times. In vessels, personnel, equipment, and organisation, it is essentially efficient and up-to-date, as is instanced by the growing development of motor-driven craft to cater for the particular needs of trades.

Peruvian Market for Calcium Arsenate

THE use of calcium arsenate as an insecticide on cotton plants in Peru has become popular since aeroplane dusting was initiated in 1927. The average imports for the four years ended 1931 approximated 780 metric tons annually.

The Industrial Measurement of Temperature

Conditions which Determine the Choice of Instruments

INDUSTRIAL temperature-measuring instruments of many types are necessitated by the wide range of temperatures and the innumerable applications encountered, but within the scope of this article it is possibles to deal only briefly and on general lines with the more widely used equipment. For convenience, the various types are described in an ascending scale of temperature, and, in connection with the temperature ranges given for each class, it should be understood that these ranges are meant to serve as a general guide only and may often be extended by special design or precautions during use.

Of many types, expansion thermometers all depend on the difference of expansion between two substances, the ordinary mercury-in-glass thermometer being, perhaps, the best known example and needing but brief reference. Many special designs of mercury-in-glass thermometers are in use and, generally speaking, while they may be made extremely accurate, they are delicate and somewhat difficult to read. Their mechanical strength may be increased by the use of a metal sheath, but, in many cases, this will result in an increased time lag in registering temperature changes. Considered as a whole, mercury-in-glass thermometers provide a comparatively cheap and accurate method of measuring temperatures up to a maximum of 400° C.

Mercury-in-Steel Thermometers

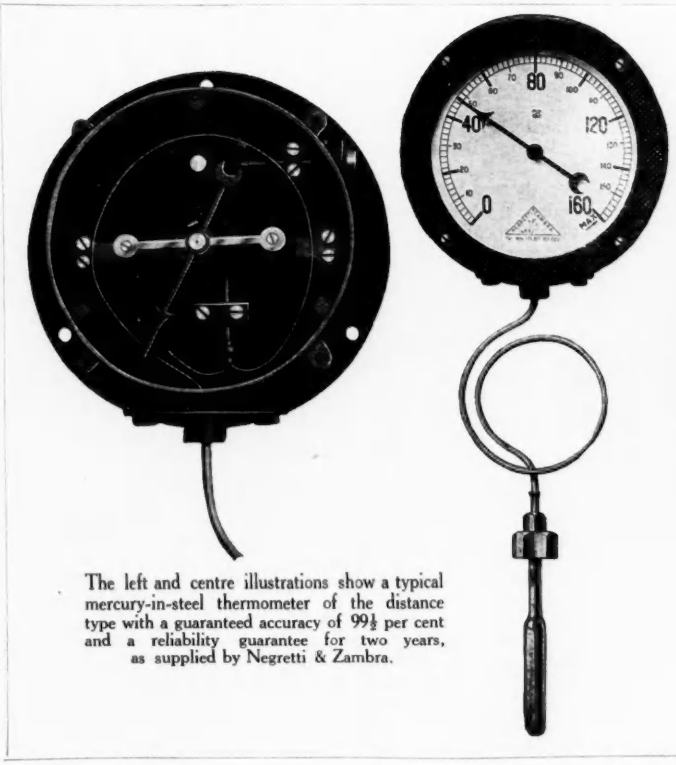
Mercury is used also encased in a steel bulb or chamber connected to an indicating or recording pressure gauge of the Bourdon type but scaled directly in degrees Fahrenheit or Centigrade. The connection is made by steel capillary tubing of extremely fine bore, so that the instrument can be mounted at a distance from the heat-sensitive bulb; this distance is limited, however, by the expense and rigidity of such connections and in those cases where fairly long runs are required, say over 30 ft., it is preferable to consider one of the electrical instruments described later in this article. The mercury-in-steel thermometer provides a simple and convenient method for temperatures up to 600° C. where distant indication or recording is required. Its fool-proof and robust construction makes it highly suited for industrial service, but there are disadvantages which must not be overlooked. Firstly, there is a considerable lag in registering changes in temperature due to the large mass of the bulb; secondly, inaccuracies may arise due to any difference in level between the instrument and the bulb; and thirdly, its inseparable construction necessitates the return of the complete instrument to the makers in the event of repairs or replacements being required.

A third type of expansion instrument in common use is similar to the mercury-in-steel thermometer, but is filled with the liquid and vapour of some volatile substance such as mercury or ether. Known as the "vapour-tension" thermometer, it has the same general characteristics and range as the mercury-in-steel instrument but the low pressure developed at temperatures below 100° C. does not make it reliable for work below this figure. In some cases, it is claimed that satisfactory operation up to 800° C. is obtainable, but this is not recommended for general service in view of the possibility of a permanent or sub-permanent change in the metal bulb when subjected to such high temperatures. This change may effect the zero position, or in other words, the accuracy of the instrument.

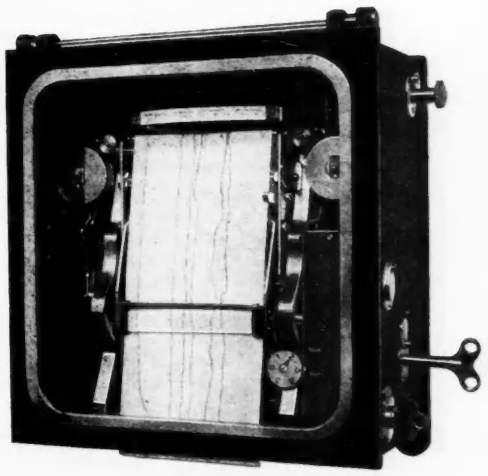
Electrical Equipment

In normal practice it is advisable to use instruments of the electrical type for all temperatures over 500° C. Electrical instruments may also be used with much advantage for temperatures far below this limit, but before dealing in detail with the various types available, it will be advisable to consider the common attributes of electrical temperature measuring apparatus.

As with all electrical equipment, the main advantage is the facility with which the sensitive part may be connected through long distances to the indicating or recording instruments by means of copper cable or other comparatively cheap material. The equipment can also be made up of a number of components each of which is a separate replaceable unit, thus facilitating replacements or repairs on site. A further



The left and centre illustrations show a typical mercury-in-steel thermometer of the distance type with a guaranteed accuracy of 99½ per cent and a reliability guarantee for two years, as supplied by Negretti & Zambra.



On the right is a multi-point recording pyrometer This type of instrument is finding extensive application in the chemical industry. The one illustrated is manufactured by the Foster Instrument Co.

advantage of importance is the possibility of measuring the temperatures of a number of scattered points at a central or control position by means of a switchboard or, in the case of a recording instrument, by incorporating an automatic commutator. When considering electrical equipment, however, it must be remembered that reliable and accurate service can be obtained only by the correct choice of suitable equipment and this is a matter on which the maker, with his wide experience, should be consulted. Having settled the details of equipment, care should be taken during installation to see that all connections are clean and reliably made as the voltages used are small, and any additional resistance in the form of dirt, or a bad connection, will result in an inaccurate reading.

The Moving Coil

In most cases, the indicating or recording instrument is a millivoltmeter of the moving coil type, scaled in degrees of temperature. This moving coil is the " heart " of any installation and the method by which it is supported is of considerable importance to the user as the forces available to turn this coil are small, consequently, the coil must be mounted in such a way as to prevent frictional errors. At one time, this was done by suspending the coil on a thin and fragile metal strip, which was highly successful as far as sensitivity was concerned, and is used even to-day for research purposes. In the general run of industrial work, however, this method was found far too delicate and also required accurate levelling and mounting in a position free from vibration. Such a condition was difficult to fulfil in the average works, consequently, pivotted movements have been developed in which the coil is swung on two finely pointed steel pivots working in jewelled bearings. This method is far more robust and has widened enormously the field of application for electrical equipment; it will be appreciated, however, that damage or wear to the pivots will result in additional friction and the consequent inaccuracy. Many systems of cushioning or springing of the pivots against shock or vibration have been evolved, with varying degrees of success, to overcome this difficulty. One particular design, known as the " Resilia," merits special mention as being the only system in which the pivots and jewels are fully protected from shock or vibrations in all directions, this being achieved by an ingenious system of spring mounting, an instrument so fitted being capable of maintaining its accuracy under the most severe conditions of use.

For relatively low temperatures, the electrical thermometer is used, its action being based on the principle that the resistance of a coil of wire changes with change in temperature. The heat-sensitive " bulb " takes the form of a coil of wire mounted on a former and inserted into a protection chamber of some robust material such as steel, copper or nickel depending on the particular application, the resistance being measured by means of the well-known Wheatstone bridge with which a very "open" scale over a limited range is obtainable.

Electrical Resistance Thermometers

With some designs, indicating instruments have to be balanced manually before a reading can be obtained, but recorders working on the same principle are available in which the balancing is carried out automatically. To obviate this manual operation, another class of instrument is available and is arranged to be in balance for a definite temperature, the actual temperature of the " bulb " being measured by the " out of balance " deflection of the galvanometer. As with all bridge methods, a source of external current supply is necessary, and here again, industrial types can be divided into two classes, those which necessitate the setting by hand of a rheostat to give a pre-determined voltage and those fitted with some type of automatic voltage compensation. Needless to say, the later type is preferable for industrial purposes and where recording instruments are required. Portable instruments are operated usually from a small dry cell or accumulator but, for permanent installations, mains-operated units are now obtainable.

For normal purposes, the range of the electrical thermometer may be set at − 200° C. to + 500° C. as temperatures above this limit can be measured with more convenience by the thermo-couple method, but for research work or extreme accuracy it may be found preferable to use the resistance thermometer for even higher temperatures up to 1,000° C., although for technical reasons such practice is extremely difficult and should be confined to the laboratory.

When the junction of two dissimilar metals or alloys is heated, a minute voltage or E.M.F. is developed depending on the difference between the temperatures of the hot and cold junctions of the two metals. A thermo-electric pyrometer consists, therefore, of a suitable thermo-couple attached to a millivoltmeter by which the voltage generated is measured, without the necessity of any external source of current supply as is used with the " resistance " thermometer. Normally, the dissimilar metals take the form of two wires insulated with porcelain beads and having a fused junction, the composition of the wires depending on the maximum range for which the instrument is required. For the lower ranges, say up to 900° C., a concentric form of thermo-couple is also used composed of an outer tube forming one element, the other being a wire down the centre of the tube from which it is insulated, this couple having the advantage of great mechanical strength. Here it will be noted that the voltage generated is dependent on the difference between the temperatures of the hot and cold ends of the thermo-couple. As it is desired to measure the temperature of the hot end, it is therefore necessary to make some correction to the instrument to take into account the varying temperature of the cold end. At one time, this necessitated a mental correction to the instrument reading, but with modern installations, by use of " compensating " cable and other automatic devices, means have been devised whereby the reading is correct irrespective of variations in the cold end temperature.

Thermo-Couple Sheaths

Thermo-couples can be divided into two classes—(1) " base-metal " couples in which the alloys are of some comparatively cheap material such as iron, constantan, nickel, nickel-chrome, etc., and (2) " rare-metal " couples composed of more expensive materials such as platinum, rhodium, or iridium. In this connection, the use of the words " base " and " rare " must not be understood as applying to the performance of the particular metals but rather to their cost. For the lower temperatures, say up to 1,100° C., for continuous working, the base metal couples are preferable as being cheaper and therefore capable of being made economically thick and robust; furthermore, such base metals usually generate an E.M.F. approximately three to four times as great as that produced by a rare metal couple, thus allowing of the use of a less sensitive but far more robust and reliable indicator or recorder. For continuous working above 1,100° C. and up to 1,400° C., also for short tests up to 1,600° C., it is necessary to use rare metal thermo-couples which must be of fine wire due to their high cost and are accordingly somewhat fragile.

With all thermo-couples working continuously above 600° C., it is essential to adopt some form of sheath to protect the thermo-couple elements from rapid oxidisation or corrosion. With the base-metal couples, sheaths may be of steel, possibly calorised, or alternatively nichrome, both of which are mechanically strong or else of a refractory material such as fireclay, depending on the working temperature. For rare metal thermo-couples, working at the higher temperatures, a refractory sheath highly resistant to thermal shock, with an inner sheath of some non-porous material, such as glazed porcelain, is recommended, but in all cases the choice of a suitable sheath is a matter requiring considerable knowledge and experience and users are strongly recommended to leave this matter to the discretion of the makers.

Indicators and Recorders

Indicators or recorders are generally of the direct deflection type which provides a simple and reliable method of measuring the E.M.F. generated by the thermo-couple. This being a simple measurement of voltage, it is essential that the circuit resistance should be constant, or else, following Ohm's law, an inaccurate indication will result. Certain of the instrument components, especially the cables, are of copper or some other material whose resistance is affected materially by changes in atmospheric temperature; to overcome this, a " swamp " or ballast resistance of material having a negligible temperature-resistance coefficient is inserted into the circuit in such proportions that a change in the resistance of the copper is negligible compared with the total circuit resistance. There are, however, installations in which such

long lengths of copper cable are required that possible changes in the circuit resistance may result in serious error; in such cases, the measurement can be made most conveniently with the potentiometer working on the balance or "null" method. In this case it is necessary to balance an indicating instrument by hand, but potentiometer recorders are normally arranged to be self-balancing. This latter type of instrument is, of course, much more complicated and expensive than the

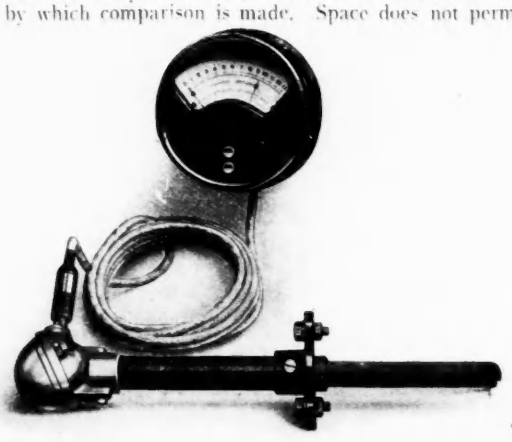
Indicating Mercury-in-Steel Thermometer
(Cambridge Instrument Co.)

normal type of direct deflection recorder but can be made with a very open scale over a narrow temperature range. There are, of course, methods by which the direct-deflection instrument can be supplied with "set-up" scale, *i.e.*, a scale not commencing at zero, in order to give a more open reading, but such methods are not recommended in view of the difficulty of checking the zero and also the cold junction setting.

Optical Pyrometers

So far, the instruments described all depend for their operation on the insertion of some heat-sensitive object into the hot zone, the temperature of which is to be measured; for higher temperatures it is necessary to utilise instruments working entirely at a distance from the hot body and these may be divided into two types both depending on the radiations of heat and light. While working on fundamentally different principles both have certain common characteristics which make it convenient to discuss the two types together.

Subject to certain conditions, the light emitted by a hot body bears a definite relationship to its temperature; this fact is, therefore, utilised in the optical pyrometer which is a photometer and consists generally of a telescope, through which the hot body is viewed, and some form of standard lamp by which comparison is made. Space does not permit

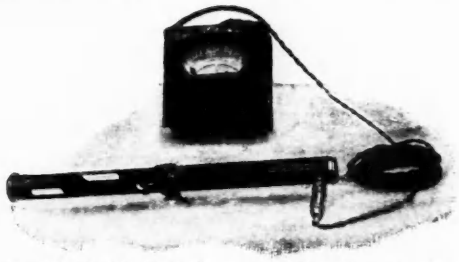


Indicating Thermo-Couple Pyrometer (Foster Instrument Co.)

of a detailed description of the numerous designs available; particulars are given of the "disappearing filament" type. This instrument takes the form of a telescope containing an electric lamp, the filament of which is rendered luminous by a small battery or portable accumulator, the brightness of the filament being controlled by a rheostat. In use, the hot body is viewed through the telescope and the lamp filament is seen apparently superimposed upon it; the user then adjusts the rheostat until the brightness of the tip of filament just matches or "disappears" into the colour of the hot body. The temperature is then read from the indicator which is virtually a milliammeter and serves to measure the current passed through the lamp to obtain the necessary degree of brightness. In better designs the rheostat and indicator are mounted on the body of the instrument, this being more convenient than having a separate rheostat and indicator.

Radiation Pyrometers

Radiation pyrometers utilise the total range of heat radiated by the hot body, such as one feels when passing in front of an open fire or furnace. The instrument usually takes the form of a tube combined with some device to ensure



Portable Total Radiation Pyrometer (Foster Intrument Co.)

that the instrument is used under the conditions for which it has been calibrated, in which case its operation is correct irrespective of the working distance. By means of lenses and mirrors, the heat is concentrated on to a small sensitive element which generally takes the form of a minute but highly efficient thermo-couple working on the same principles as described for the normal type of thermo-couple pyrometers. With such an instrument various types of recording or indicating apparatus can be used, generally similar to those adopted with thermo-couple pyrometers. There is also another simple radiation instrument worthy of special notice in which the sensitive element is a small bimetallic spiral to which the indicating pointer is directly attached, compensation being provided for changes in air temperature within the instrument itself. In this case there is an extremely small and simple instrument, very convenient to use but not having the facilities of distance indication or recording as is possible with the electrical instrument.

Disappearing Filament
Optical Pyrometer
(Foster Instrument Co.)

As a quick guide to the correct choice between the optical and the radiation pyrometer, it is of interest to compare their main features. With the optical instrument, a manual operation is necessary and an indication of temperature may be obtained in about 30 seconds, but continuous indications or records are not possible. The instrument can be used on a small hot body and viewed from a long distance, for temperatures above 750° C., there being no upper limit. With the radiation pyrometer, apart from pointing the instrument, no manual operation is required and a reading or automatic record may be obtained within 15 seconds. It is suited for temperatures above 500° C., again without any upper limit; but at the same time a shorter working distance is necessary and also a fairly large hot body at which to point the instrument. It will be seen, therefore, that the optical pyrometer is mostly used for "exploring" work, while the radiation instrument is more convenient for continuous processes. When using either an optical or a radiation pyrometer, it should also be remembered that the laws on which they operate are dependent on the hot body (whose temperature is to be measured) being under "black body" conditions, *i.e.*, devoid of all reflecting power. Fortunately, such conditions exist in a furnace or kiln where the object is surrounded by a uniformly heated enclosure and is seen through a small aperture. If, however, the temperature is measured with the hot body in the open, a correction must be made.

A New Division of the Smaller Gram Weights

By Dr. F. SARTORIUS, of Gottingen

THE exactitude of a weighing obviously depends chiefly on the balance, and the weights which are used. The accuracy of the balance is generally more constant than the weights since the latter is subjected to more wear, and are affected by temperature variations, barometric pressure, and general conditions. An essential factor which has to be observed by the manufacturer is that the thickness of the weights is regular from the fractional up to the larger weights, an acknowledged fact with good quality weights. Each weight, however, possesses a small error according to the fineness of the adjustment, *e.g.*, 0.1 mg. It is, therefore, clear that the larger the number of weights used, the larger will be the error, and it is only by reducing this number by a more practical division of the smaller gram weights, that it can be minimised.

Up to the present time, the most useful division of the weights below 10 gram was (1, 1, 1, 2 and 5) or (1, 2, 2, and 5) gram. For micro balances W. Felgenträger ("Zeit. f. Analytical Chemie," 1931, *83*, 422) suggested a set consisting of 1, 2, 3 and 4 gram weights, which, without doubt is more satisfactory than the old divisions mentioned above. Taking the length measurements into consideration G. Berndt ("Grundlagen und Geräte technischer Messungen," 2nd Edition, Berlin, 1929) suggested 1, 2, 4 and 7 grams, which requires the least number of weights, but has the distinct disadvantage of not allowing many of the weights to be compared with one another on the balance. (In this case the 1, 1, 1, 2 and 5 gram has the advantage.) Much more advantageous, however, is the division 1, 2, 3 and 5 grams, which allows the minimum number of weights to be used and at the same time permits a larger number of comparisons to be made between these and other weights in the set. Below will be found a table showing the comparison of the usual division, and that suggested by Felgenträger, with the new Sartorius division in the last column.

Total Weight (grams).	Combination of Weights actually used. Usual Division. 1, 2, 2, 5 gram	Felgenträger. 1, 2, 3, 4 gram	Sartorius. 1, 2, 3, 5 gram
1	1	1	1
2	2	2	2
3	1+2	3	3
4	2+2	4	1+3
5	5	1+4	5
6	1+5	2+4	1+5
7	2+5	3+4	2+5
8	1+2+5	1+3+4	3+5
9	2+2+5	2+3+4	1+3+5
Total Weights	17	16	15

On further consideration, it is noticeable that the whole experiment could be more practicably executed with a set of 1, 2, 3 and 5 gram weights, as the totals are even more readily composed without the weights having to be moved so often, in which latter case a small wear always take place. By this means a composition of the smaller weights has been attained, and the total error considerably reduced, giving at the same time quicker manipulation of the weights, with less total wear for the latter.

Plastics and What they Are

Lectures at the Plastics Industrial Exhibition

MR. H. V. POTTER, the chairman of the Plastics Group of the Society of Chemical Industry, delivered the first of the series of lectures which are being given every week throughout the duration of the Plastics Industrial Exhibition at the Science Museum, South Kensington.

At the commencement of his address the lecturer said that treating it in its broadest sense the word plastic meant a material which took shape or form and retained that form for a period of time. The technical plastics covered by what is now known as the plastics industry might be described as materials which took shape or form by application of heat with or without pressure and retained that shape on cooling. Bituminous plastics were made from natural asphaltic material, enormous deposits of which were to be found in the Rocky Mountain district. This bitumen material was chiefly suitable for use as a basis for plastics of the non-heat hardening type and when incorporated with fillers such as asbestos, etc., formed the basis of insulating moulding used in the electrical industry.

Shellac, which was obtained in thin flakes by pouring the refined molten lac on rotating drums or by stretching by hand, entered largely into the manufacture of the rigid gramophone record which industry had used as much as 20,000 tons annually.

Celluloid, made by treatment of cotton with a mixture of nitric and sulphuric acid, was first commercially produced in 1869; to-day, the world production varied from 30,000 to 40,000 tons per annum.

Dealing with synthetic resin plastics, Mr. Potter said the first of these to be commercially developed was bakelite. This class of plastic was dependent on phenol and formaldehyde. These materials react together to give a hard transparent amber-like body which was inert in many solvents, chemicals and conditions and finally was a relatively good insulator. Another member of this class was amino resin, in which urea or thiourea was used instead of phenol; this produced a water-white or opaque product. These synthetic resinoid plastics readily flux under heat and pressure and are introduced into a steel mould in which the design of the final article is cut or engraved on the opposite or negative form; when subjected to heat and pressure the material rapidly fuses and takes the shape of the containing mould, chemically hardens, and can be ejected from the mould in the solid finished form. This chemical process is sometimes known as "freezing by heat." Glyptal, prepared from glycerin and phthalic acid was not used extensively in the moulding industry on account of the long period for which it had to be heat hardened. It was, however, used in the paint and varnish industry in the manufacture of quick-drying enamels and paints.

After dealing with cellulose plastics, Mr. Potter said that, although comparatively new, the plastics industry represented a turnover of £20,000,000 and employed many thousands of persons. He was sure that it would play a very important part in the industries of the country, and the artist, the architect, and the engineer had available for his use a new material of great possibilities. Finishes could be produced in the manufacture of articles instead of the costly process of applying them afterwards being necessary; flat surfaces of colour previously only obtainable by a long process of painting and polishing could be had as part of the plastic product, and it was now possible to produce sheets of plastics which were fire and water resistant, relatively flexible, machineable and in some cases chemically resistant.

Further Lectures

Further lectures dealing with branches of the industry, are to be given at 4.30 p.m. in the lecture theatre of the Science Museum on the dates indicated below: May 3, "Plastics—Urea-formaldehyde Types and Their Uses" (Mr. Kenneth Chance); May 10, "Plastics and the Fabricator" (Major H. C. Parker); May 17, "Plastics—Their Use in the Paint Industry" (Dr. L. A. Jordan); May 26, "Plastics—Their Use in Denistry" (Professor C. S. Gibson); May 31, lecture by Professor G. T. Morgan; June 7, "Plastics—The Phenolic Types and Their Uses" (Mr. George Dring); June 14, Cellulose Esters and Ethers and Their Uses" (Dr. W. J. Jenkins); June 21, "Plastics and the Architect" (Mr. Raymond McGarth); June 28, "Plastics—Their Use in the Electrical Industry" (Lt.-Col. K. G. Maxwell).

Questions and Answers

Technical, Industrial and General

WITH a view to promoting closer co-operation between members of the chemical industry who are in search of information on technical, industrial and general points and those who are in a position to supply these requirements, a selection from the large number of questions received is given under this heading. It is important that the full data in regard to each question that is asked should be put before us, or the answers given will have less value than they might otherwise possess. In cases where the answers are of general interest, the answers are published; in others, the answers are simply passed on to the inquirers. Readers are invited to co-operate in supplying information on the subjects of the queries and in augmenting replies already given.

188—COPPER SULPHATE EXPORTS.—We should be obliged if you could give us any information of the approximate quantity of copper sulphate which is used annually in the British Isles for agricultural purposes, and also if you could state the approximate quantity which is exported annually from this country.

No information is available with regard to the first part of the question. The total export of copper sulphate from Great Britain for the year 1932 was 47,525 tons, valued at £806,124. According to the Board of Trade returns, the exports in 1931 amounted to 38,975 tons, valued at £714,036, and in 1930 the figures were 42,359 tons, valued at £944,664.

189—SODIUM SULPHIDE PLANT.—An inquiry has been received from a Continental firm for information regarding plant, furnaces, etc., for the manufacture of sodium sulphide, and the names of firms in this country engaged in the construction of such plant are required.

The name and address of a British firm has been supplied.

190—"STORAL."—We should be glad if you could indicate to us the name and address of the manufacturer of "Storal," which we understand is a new lacquer recently placed on the market.

"Storal" is a new lacquer consisting of thin scales of aluminium bronze powder. It is stated that the scales arrange themselves parallel with the surface, reflecting 70 per cent. of the light and producing the appearance of an unbroken metal coating. It is produced by Storal-Industries, Grevenbroich, Rheinland, auf der Schanze 54.

191—WATER SOFTENING MATERIAL.—We should be pleased if you could give us the name of a British or Irish firm supplying natural zeolite for water softening purposes.

The name and address of a British firm has been supplied.

Queries Awaiting Replies

192—"ACIDITE" TUBES.—A paper manufacturer is contemplating renewing all his water service pipes, etc., and in view of the fact that ordinary galvanised iron pipe scales and corrodes slightly owing to the acid properties in the water he does not desire to use either iron or copper tubing. Some time ago he was put into touch with "Acidite" tube, but is now unable to obtain information regarding the source of supply. The name and address of the manufacturers is required.

193—OXIDATION OF TIN.—A British enamel manufacturing firm is anxious to get into touch with makers of a plant suitable for the oxidation of tin. Names and addresses of such makers are wanted.

Chemical Industry Lawn Tennis Tournament

Last Opportunity to Enter

ENTRIES for the third annual Chemical Industry Lawn Tennis Tournament close on Monday next, May 1, and all entry forms should therefore be posted to the offices of THE CHEMICAL AGE not later than to-morrow night. For the convenience of any players who may not have received entry forms in sufficient time, we shall be prepared to accept entries written on ordinary notepaper. Such entries should state the names of the competitors, the firms they represent, with addresses and telephone numbers, and should be marked "Singles" or "Doubles." The tournament, which is extended this year to include men's singles as well as men's doubles, is open to all members of the industry, whether principals or members of staffs. The rules of the tournament are reprinted below. There are silver challenge cups to be held by the winners for one year, and miniature cups to be presented outright to the winner and runners-up. The draw for the first round will be made next Tuesday and full particulars of the draw will be published on May 6. As in previous years there will be a new draw for each round. In the early stages of the tournament the country will be divided into areas, the geographical limits of which will depend upon the number of entries from each locality, in order that the difficulties of travelling may be minimised.

Rules

1. Every competitor must be a member of the chemical industry, either as a principal or a member of a staff. There is no entrance fee of any kind.
2. Each pair in the Doubles Tournament must be members of the same, or an associated, firm.
3. The Challenge Cups shall be competed for annually on courts of any surface in accordance with the Rules of Lawn Tennis and the Regulations of the Lawn Tennis Association. The winners of the Cups shall make arrangements for their safe custody and insurance.
4. The competition shall be conducted on the knock-out principle, and the best of three advantage sets shall be played in all matches, except in the Final of the Singles, when the best of five sets shall be played.
5. **Entries shall be made not later than May 1, 1933, and addressed:**

"Lawn Tennis Tournament,"
"The Chemical Age,"
Bouverie House,
Fleet Street, London, E.C.4.

6. The draw shall be made on the first convenient day following the close of entries. The dates on or within which the several rounds must be played will be published in THE CHEMICAL AGE.
7. The Editor of THE CHEMICAL AGE shall have the right to scratch any players who fail to play off their matches by the stipulated dates, or who otherwise fail to conform with the rules and regulations governing this competition.
8. Except in the case of the special period set apart for the final stages of the competition, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.
9. In the general interests of competitors throughout the country it has been decided to divide into areas as far as possible all matches up to, and including, the Semi-Finals, the rule as stated under Clause 8, however, still standing.
10. The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers) immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by the first post on the day following the final day for playing off the round.
11. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the others' appearance. If the players find it impossible to play off their match on the day originally chosen, they must play it on any other day, to which both sides agree, within the stipulated period.
12. Any dispute arising between players, or otherwise, shall be referred to the arbitration of the Editor of THE CHEMICAL AGE, whose decision shall be final.
13. While competitors will make their own arrangements as to hard or grass courts for the preliminary rounds, it must be understood that the Finals will be played on hard courts.

Controlled Light for the Laboratory and Works

New Illuminating Equipment

ANYTHING which will lower installation, running and maintenance costs of any of the hundred and one items which enter into chemical operations has a direct appeal, and in this connection may be mentioned a new development in illumination which is known as "controlled light." This system of lighting is the outcome of some years of research work by G.V.D. Illuminators, and depends for its high efficiency on the correct application and utilisation of the laws of reflection, refraction and diffusion of light. The usual lighting systems either give a well illuminated ceiling with only moderate light on the working plane or an evenly diffused light in all directions when much of it is lost. The G.V.D. system so distributes the light that whilst sufficient is allowed to reach the ceiling and walls to give adequate general illumination the bulk is brought on to the working plane where it is needed and hence results in a higher utilisation efficiency. To meet special needs various types of fittings have been evolved and whilst some of these are not applicable to chemical works those which have a direct application have been included.

Fig. 1 shows a direct type of unit which throws a very strong beam of light on to the working plane and eliminates the pool of light and ceiling shadows commonly produced by a pendant fitting. For factories where weaving operations are carried on and where one operator works two machines, the machines facing each other and the operator standing between them, this fitting is very suitable as the fronts of the machines are well lighted and the backs which do not call for special illumination are sufficiently lighted, but not more than necessary, by the rays given out in a lateral direction. Where a more even light is required the fitting shown in Fig. 2 is employed. For office use this permits the minimum number of points and the best lay-out of office equipment. The bowl may also be supplied in daylight glass, which produces a light of so good a colour-matching quality that for non-technical purposes it is daylight. This shadowless daylight is suitable for drawing offices, stores, etc.

In the case of rooms which require artificial light all the year round G.V.D. Illuminators have produced a system of "laylighting" which gives a high degree of evenly diffused light with a very low current consumption. Such an installation is shown in Fig. 3. In this connection we would state that a laylight on this principle is being installed at the Tate Art Gallery. Such laylights are supplied with the ordinary artificial light fittings but they can also be erected with artificial daylight. In modern buildings, due to high ground rents and restriction of building heights, it is often necessary to go below ground one or two floors. For this case the daylight laylight would appear to be an excellent lighting system. A further development of this firm, though differing from the details given above is a precision daylight unit which has many uses in chemical laboratories. G.V.D. Illuminators invite any members of the staff of chemical works who are interested in illumination problems to call and inspect their London showrooms where all the items mentioned in this article can be seen, together with other interesting applications of controlled light.

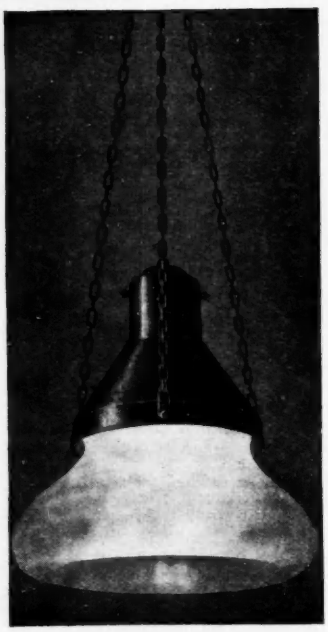


Fig. 1 (right)—Pendant Unit for Direct Lighting
Fig. 2 (left)—G.V.D. Indirect Lighting Unit
Fig. 3 (above)—An Example of "Laylighting"

Undersupply of Dyes in Russia

THE Soviet textile industry has experienced a great shortage of dyestuffs. Because of the undersupply of common black dye, the largest Soviet textile mills were forced to turn out gray cloth instead of black. During 1932, entire departments of the huge textile mill plant in Ivanovo-Voznesensk were obliged to stop operation several times. On the whole, the supply of dyestuffs for the textile industry did not exceed 65 or 70 per cent. of the demand in 1932.

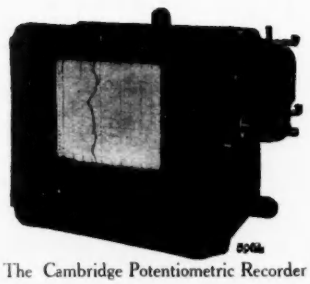
Drop in Polish Dye Trade

POLISH imports of dyes in 1932 dropped over a thousand metric quintals below the 1931 level. Although Poland is a dye producing country, practically all of its output is consumed locally, its exports in 1932 being almost insignificant. Trade sources estimate that Polish manufacturers increased the dye output by about 20 per cent. in 1932, or about 1,260 metric tons, but this was used in supplying a larger share of the domestic requirements than in previous years.

Temperature and Pressure Measurement

A Useful Range of Instruments

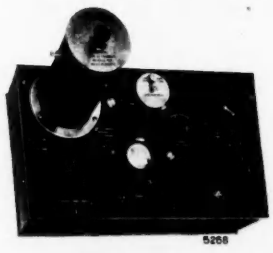
IN temperature and pressure measurement, gas analysis, electrometric chemical analysis, and many other fields, the instruments manufactured by Cambridge Instrument Co., Ltd., claim to possess a reputation for reliability, workmanship and precision. Improvements in design and extended ranges are continually being introduced in practically every type of instrument. Among the temperature measuring instruments, reference may be made to the recent developments of flush-mounted panel indicators and recorders for use with electrical distance thermometers and thermo-electric pyrometers. Potentiometric recorders are now supplied by this firm as an alternative to their well-known thread recorders, while a recent important development in the latter is the introduction of a new two-point recorder (Model B), which possesses all the advantages of the standard Cambridge thread recorders, but by reason of its simplified designs, can be supplied for recording two different temperatures on one chart, at a considerably reduced cost. Among recent improvements in Cambridge temperature indicators, perhaps the most outstanding is the new patented illuminated moving scale indicator. In this instrument the scale is engraved on transparent material and is optically projected on to a translucent screen carrying a fixed pointer. It forms a highly satisfactory indicating unit, being easily readable at a considerable distance, and can be readily arranged for flush mounting on panels.



The Cambridge Potentiometric Recorder

Cambridge Two-Point "Model B" Recorder

For some years the Cambridge Instrument Co. have supplied a series of 4-inch dial thermometers working on the vapour pressure principle, which by reason of their robustness, ease of reading and low cost, have replaced glass thermometers in wide and increasing fields of applications. This useful series has now been extended by the inclusion of gas-filled thermometers of similar design, which can be used for temperatures up to 800° F. A further development is a small recording thermometer working on the same principle, which has a 24-hour translucent chart 6½ in. in diameter, with the pen operating from behind, the whole record being thus visible without obstruction. This attractive new Cambridge thermograph will doubtless prove extremely valuable in enabling manufacturers to obtain temperature records in many applications where the higher cost of larger recorders has hindered their adoption.



Cambridge Direct Reading pH Meter (Electrometer Valve Type)

Referring to the Cambridge mercury-in-steel thermometers, it is important to note that a new bulb construction has recently been adopted, which has enabled these reliable instruments to be supplied for indicating or recording higher temperatures, up to a maximum of 800° C. The Cambridge type of thermograph has also been re-designed to provide still larger and clearer circular charts, 10 inches in diameter.

With regard to temperature measurement, reference must be made to the considerable advance in the adoption of automatic temperature regulation. Instruments are available for accurately controlling temperature, pressure, humidity, voltage or other available conditions by regulating electric switches, gas, oil, air, steam or water valves. The latest form of potentiometric recording controllers will operate motor driven valves or electric switches up to 10 amperes at 250 volts without intermediate relay. Simpler regulators include a small self-contained gas regulator.

In gas analysis, as in temperature measurement, Cambridge instruments cover a wide and comprehensive field of applications. Based upon the electrical katharometer method, due to Dr. G. A. Shakespear, these instruments can be supplied for indicating or recording the percentages of CO_2, SO_2, hydrogen, oxygen, etc., in other gases or in mixtures of gases. The latest design of CO_2 metering unit for boiler flue gases is exceptionally robust, being entirely of metal, and is thoroughly reliable in working.

The Cambridge Illuminated Moving Scale Indicator

Determinations of the hydrogen-ion concentration of solutions are an important part of the work of the chemist, not only in connection with research work, but as a matter of routine in industrial processes. Electrometric outfits of the highest precision for the research chemist, and simpler, more compact outfits for routine measurements, have been supplied in large numbers by the Cambridge Instrument Co. The new Cambridge electrometer valve *pH* meter, however, marks a distinct advance in the simplification of hydrogen-ion measurements. This instrument forms a complete unit for direct *pH* measurements, and is specially designed for use with glass electrodes, but it may also be used with electrodes of other types. It is particularly valuable for routine work, and, when used in conjunction with the Morton glass electrode, is as simple in operation as an ordinary potentiometer. Recording *pH* outfits have also recently been developed by this firm.

The Guatemala Paint Market

ONLY one firm in Guatemala City, handling paints, appears to have maintained normal sales during 1932, while all the others reported poor business. Stocks on hand of ready-mixed paints are more than sufficient to meet immediate requirements. Two or three firms report almost no movement in the last half of 1932. The situation is due to lack of construction and postponement of repainting on the part of owners of buildings the rentals of which have markedly decreased and in some instances are uncollectable.

Absolute Colorimeter in the Laboratory

Measuring Procedure in Micro Analysis

COLORIMETRY as a method for chemical micro analysis is becoming more and more indispensable for biological and industrial laboratories alike. All dipping colorimeters either of the Duboscq type or those used as compensating colorimeters require as a standard a colour solution of known concentration, with which the solution of unknown concentration is compared.

The essential feature of the new Leitz absolute colorimeter is that in place of a colour standard a neutral grey filter solution is used. This, of course, is only possible by the application of monochromatic light, and the eyepiece therefore contains a revolving disc with 11 monochromatic filters, with the optical centre of gravity ranging from 434 to 720$\mu\mu$ and the colour ranging from violet, through blue green and orange, to red.

The application of these filters makes the use of a powerful source of light imperative. The absolute colorimeter is therefore equipped with a lamp attachment entirely enclosed and which is adapted to the instrument by a slide fitting. The lamp itself is a 6 volt 5 amps. low voltage lamp in centering mount. A 2-lens condenser is provided as a further help to adjust the illumination of evenness. The bulb

The Leitz Two-Stage Colorimeter

is connected to the main by means of a resistance or transformer. By the introduction of the above arrangement it has become possible to apply colorimetry even in cases which were considered hopeless with the ordinary type of colorimeter on account of the very unfavourable colour to match (yellow or red) or because a colour standard was difficult to make up. The Leitz absolute colorimeter not only overcomes these difficulties but also allows of reading directly on the scale giving the depth of the grey filter solution the concentration of the solution under test, in grams or milligrams per 100 cc.

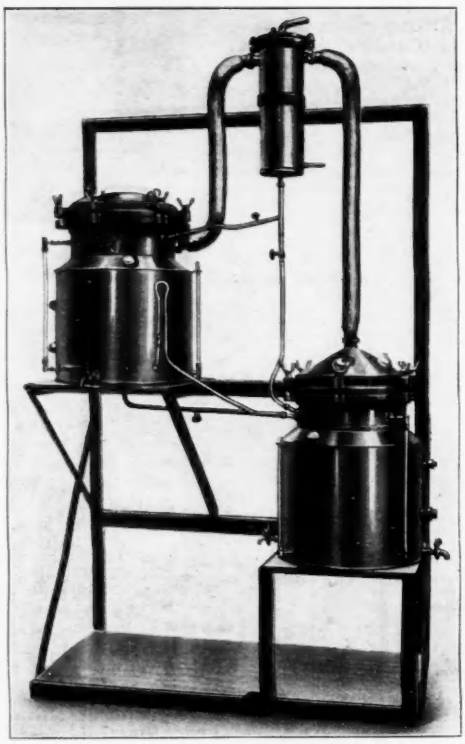
The measuring procedure is that, having calibrated a certain depth of grey filter solution by a colour solution of known concentration, using a certain filter, one knows that that depth of grey filter solution with that particular filter corresponds to a certain concentration of the particular substance. The rest is obvious. In future determinations of the same substance, the test solution is simply compared with the grey filter solution. The great simplicity of directly reading the concentrations, as pointed out above, comes about by ascertaining the so-called calibration value of the grey filter solution, which is $\frac{dv \times a}{dg}$ where dv is the depth of the colour solution of known concentration, a is the respective concentration and dg is the depth of grey filter solution. Setting the plunger in the solution to be tested to this value enables one on matching to read off the concentrations directly on the scale for the grey filter solution.

Compared with photometers, which are also used for colorimetric determinations, the absolute colorimeter (also called dipping spectro photometer) has the advantages of greater convenience and rapidity in use, the possibility of adjusting the depth so as to suit individual requirements (some photometers use vessels of definite depths and the liquid has to be transferred from one into the other if the depth is not suitable), direct reading of percentages, provision for micro beakers holding 1 cc only, in addition to which it is at least of equal accuracy and is considerably cheaper. The accompanying illustration shows the 2-stage Leitz colorimeter with absolute arrangement and illuminating attachment. By means of the 2-stage compensating colorimeter one can neutralise the effects of secondary substances, *i.e.*, turbidity, secondary colours, or impurities.

An Improved Soxhlet Extractor

Double Entry Arrangement

AN improved type of Soxhlet extractor has been designed and manufactured by Brown and Son (Alembic Works), Ltd. In this plant, the usual Soxhlet syphon reflux action is used, but in addition a double entry is arranged to the condenser, with by-pass cocks to enable the material being extracted to be thoroughly dried and all solvent returned to boiler. A further improvement is that the weak solution fats or oils



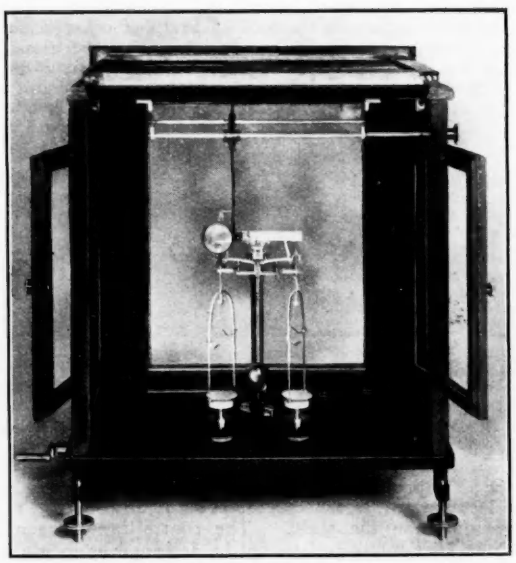
Improved Type of Soxhlet Extractor

may be concentrated without removal. This is done by using the plant as a still, and the normal extraction chamber is isolated by the by-pass cocks to form a receiver for the distilled solvent. The concentrated extract may be run off and solvent is then run back to the boiler ready for the next operation. This plant saves cost of installation, losses by evaporation, and much time. Heating is done by steam or electricity, or by gas where carbon tetrachloride is used.

Three New Laboratory Balances

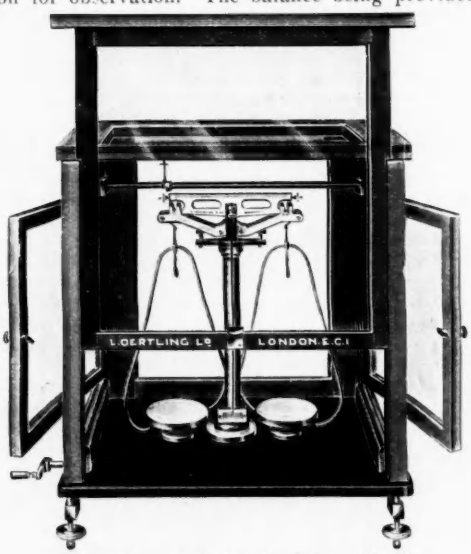
Advances in High Precision Work

SEVERAL new models of balances for high precision work, together with an inexpensive type for ordinary routine laboratory work, have recently been introduced by L. Oertling, Ltd. The new prismatic reflecting aperiodic balance will make a very strong appeal to all industrial chemists. The prismatic reading is incorporated in two models, one of which we illustrate. This balance, No. 52P, has a 7 inch gunmetal beam of a capacity of 100 grams and a sensitivity of 1 milli-



Micro-Chemical Balance No. 55

gram per division (reading to 0.1 by estimation). The reading of the balance is obtained by an enlarged optical image of the illuminated graticule attached to the pointer graduated in milligrams, the reading being projected to a convenient position for observation. The balance being provided with



The "University" Precision Balance No. 48

a most satisfactory form of air damping comes to rest with extreme rapidity. Balances of this type are already in use in Government departments and in some of the leading industrial laboratories in the country, and very gratifying reports have been received from those qualified to judge as a result of their practical experience. It is realised that, given a really reliable balance, precision weighing rarely calls for the higher activities of the trained scientific mind and that the operation soon becomes mechanical; from the financial standpoint the acquisition of this type of balance, therefore, becomes an investment.

The new micro-chemical balance No. 55 (of which we are able to show the first illustration) has a 3 inch open beam accurately serrated; it carries 20 grams and is sensitive to

Prismatic Reflecting Aperiodic Balance No. 52P

0.01 milligram direct reading or 0.001 milligram by estimation. For ordinary work the "University" precision balance (No. 48) is probably the best type of balance available for educational and industrial laboratories. Twenty-five of these balances have recently been supplied to one laboratory in London. The length of the beam is 5 inches and the capacity is 100 grams with sensitivity to 0.1 milligram; there is a plate glass base.

A New British Polarimeter

THE new B-S polarimeter, manufactured by Bellingham and Stanley, Ltd., is the first polarimeter to be fitted with a glass circle and with the centre on ball bearings. The observation telescope of this instrument remains stationary as the circle is turned, so that when the spectroscopic eyepiece is set no further adjustment is necessary; neither is it necessary to

The Bellingham and Stanley Polarimeter

clamp the circle to bring the slow motion adjustment into action. The instrument is suitable for use in measuring optical rotation from the infra-red to wavelength 2,300A in the ultra-violet. A complete range of accessories can be supplied with this instrument including the new Neron electric sodium lamp for the ordinary electric supply circuit.

For sugar estimation the new Deerr Darashaw saccharimeter is now available. This instrument has been designed with the object of making all the optical elements easily and quickly removable, and all the optical elements, including the B-S polariser unit, are arranged for use in the tropics.

Meters and Controllers in the Laboratory

Some Recent Improvements

MANY interesting designs of meters for steam, water, compressed air and gas, are manufactured by George Kent, Ltd. The CTM type manometer when used in conjunction with a differential pressure creating device such as an orifice or pitot tube will give accurate readings down to 1/15th of maximum flow. With this design a well-defined meniscus is retained throughout the range and the flow can be read off in cubic

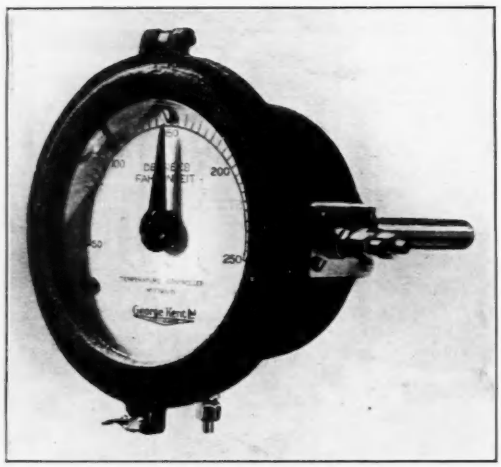


Fig. 1. Kent's Temperature Controller

feet or litres of air or gas per hour or any other desired figures. Although the flow varies as the square root of the differential pressure, giving only a small rise of the fluid at low flows, the special curved shape of the manometer tube (Fig. 3) enables an almost equally spaced scale to be used. The tube is made of celluloid and has a white background against which the meniscus of the dark fluid shows up very distinctly; in fact the scale can be read to within 1/100th of an inch. Temperature variations do not easily affect the accuracy of the manometer as the rise of the meniscus caused by the relative expansion of the fluid and the reservoir is counteracted by changes of surface tension. An equalising valve is also provided for checking the zero, and a displacer enables adjustments to be made easily. The CTH/I manometer is similar to the CTM type, but is designed for working pressures up to 20 lb. per sq. inch.

Another useful type of flow meter for air, gas or fluid measurement is the HH/I indicator (Fig. 2), made in sizes for ½, ¾, 1 and 2 inch pipes. This meter, which is accurate to within 1 per cent. down to 1/5th of maximum flow, has a range of 1 : 10 with a scale length of 10 inches and is designed for working pressure up to 100 lb. per sq. inch. The pointer is operated by a float which rises and falls in a conical chamber. As the flow increases the float is carried upwards until a position is reached where the weight of the moving parts is balanced by the upward thrust of the discharge and the drop in pressure governed by changes of the free area round the float. The float is designed so that the thrust of the fluid keeps it in a central position and the pointer which is directly attached to the float rod is enclosed in a glass tube so that all sources of friction and consequent inertia are entirely eliminated. The standard indicator will measure any clean fluid, while special instruments, functioning on the same principle, can be supplied for sugar solutions, calcium chloride solutions, ammoniacal liquor, etc.

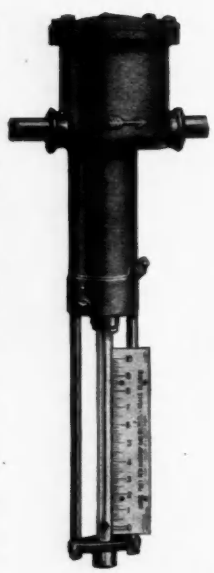


Fig. 2. HH/I Flow Indicator

Among a comprehensive range of temperature, pressure and flow controllers, there is an up-to-date and exceedingly simple type of bi-metallic temperature controller (Fig. 1). Briefly, this consists of a thermostat pocket or sheath which can be screwed into a main or the wall of a tank or other vessel, and which contains a helical bimetallic strip enclosed in mercury. Variations of temperature cause the strip to expand and this in turn actuates a shutter which regulates the amount of air

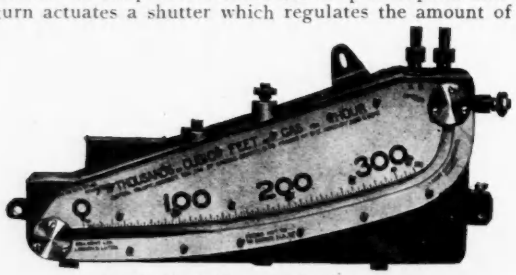
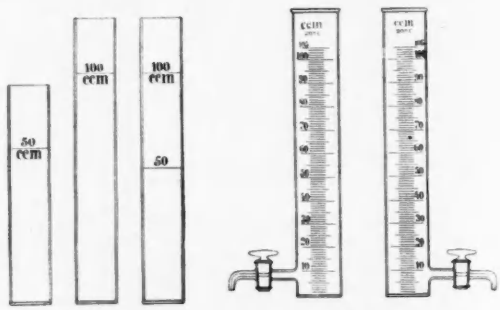


Fig. 3. Kent's Curved Tube Manometer

passing from a delivery nozzle to a receiving nozzle. The controlled diaphragm valve is operated by air pressure and the degree of opening varies with the position of the shutter between the nozzles. The construction is very robust and there is only one moving pivot. The radius of the nozzle block is adjustable so as to give varying sensitivity to suit the location, while the control point is adjusted by moving the pointer on the scale. The controlling mechanism is entirely frictionless and cannot be damaged by overload.

A New Type of Nessler Glass

AN improved type of Nessler glass has now been introduced by The Scientific Glass Blowing Co. It is a well-known fact that Nessler and colorimeter tubes, whether made from soda, crystal, or resistance glass, either blown into moulds or made by the glassblower at the blowpipe, have rarely ever been made with an entirely satisfactory clear flat bottom, as although the uneven moulded or blown surface could be highly polished on the outside, the concave or convex inner surface of these tubes could not, for technical reasons, be dealt with in the same satisfactory way as the outside surface. It was due to this difficulty that it has been an impossibility to obtain an



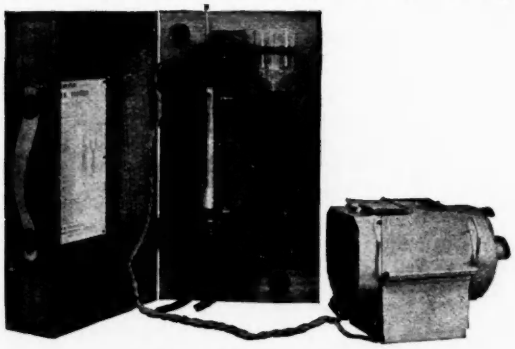
Nessler Glasses of Improved Pattern

absolutely clear optical observation field, unless a clear glass disc was cemented to the end of an accurately ground glass tube. This method, however, proved at times to be very unsatisfactory or expensive where Nessler and colorimeter tubes were in daily use. For many years it has been recognised that a more reliable Nessler or colorimeter tube at a reasonable price would be welcome. The difficulty associated with the manufacture of a clear and satisfactory tube has now been overcome, and distortion eliminated by fusing a clear neutral highly polished glass disc to the end of the tube.

Measuring Impurity in Water

The Dionic Water Tester

IN many cases it is essential to have a rapid and accurate means of determining the amount of impurity which is present in water, even when this impurity is present in very small quantities. For laboratory purposes, such a method is necessary to keep a check on the condition of distilled water, and such methods are also of service in other directions. In this connection it has been found that the electrical conductivity of a dilute solution is directly proportional to the amount of inorganic impurity contained therein, and this conductivity can therefore be used as a measure of the amount of impurity. As an example, good distilled water may have a conductivity of some three or four units (the unit being the reciprocal of a megohm per centimetre cube), and as impurity is added to the water, the conductivity would increase. Ordinary London tap water, for instance, has a conductivity of



The Dionic Water Tester

about 600 units. Conductivity of a solution, is not, however, constant, as it increases some 2.2 per cent. for every degree Centigrade rise in temperature. In order, then, that tests made at different positions may be strictly comparable, they must either be made on solutions at the same temperature, or the results obtained must be corrected to one standard temperature.

A portable apparatus known as the "Dionic" water tester, has been developed by Evershed and Vignoles, Ltd., to enable measurements of the conductivity to be made quickly and accurately. It consists of two parts, a tube and a meter. The meter contains a hand generator for providing the testing pressure, and also an ohmmeter for measuring the actual resistance or conductivity of the water; the tube contains the water to be tested. The conductivity of a column of water between two electrodes is measured, one of the electrodes being adjustable up and down an engraved temperature scale. The temperature of the water is first measured, and the adjustable electrode is then set to this value on the temperature scale. Connection is made between the tube and the meter by a twin flexible cord, and on turning the generator handle, the conductivity of the water is read directly on the ohmmeter scale. The conductivity so given is the value at 20° C. The adjustment of the electrode, by means of which a longer or shorter column of water is measured depending on the temperature, is a means of compensating for the variation in conductivity with temperature, and enables the readings given on the meter to be always those corresponding to a temperature of 20° C.

Tests with this equipment require no special preparation and the apparatus is complete in itself. The instrument is compact and easily portable and the tests can be carried out wherever it is most convenient. The equipment does not, of course, distinguish between one impurity and another, the test being quantitative and not qualitative. In many cases, however, the nature of the impurity is known. By making up a few sample solutions containing various quantities of impurity, it is possible to draw a curve giving the relationship between the conductivity and the amount of impurity. From this curve and any subsequent tests, any amount of impurity corresponding to any measured conductivity can be determined.

Control of Humidity

A Novel Laboratory Arrangement

THE control of humidity in laboratories, test rooms, process rooms, mills, etc., is of much importance. The design of control gear operated by the simple and robust hair hygroscopic device involved some difficulties which are successfully solved in the W.I.R.A. humidity control gear manufactured by Kelvin, Bottomley and Baird, Ltd. The apparatus consists of a robust "hair control unit" which operates practically designed relays mounted in another unit called the relay panel, shown in Fig. 1. The hair control unit is illustrated in Fig. 2, and consists of a stout metal frame carrying a bundle of specially treated hairs which is in some tension between a fixed pillar at one end and a spring at the other. This bundle of hairs is pulled to one side by a saddle attached to a spring blade, and engaging the hair bundle at about the middle of its length.

As the humidity varies, the length of the bundle of hairs varies so that the end of the spring blade moves between two stops. The end of the spring blade is fitted with a platinum contact piece and similar contact pieces are fitted to the two stops, one or other of these contacts being made according to whether the humidity is lower or higher than that desired to be maintained. Adjustments are provided for setting the position of the spring blade. The high and "low" humidity contacts operate their appropriate relays on the relay panel and switch in humidifying or drying apparatus as required. The hair control unit is usually suspended by two springs in the atmosphere to be controlled. A troublesome feature of relay operated apparatus of this kind has

Fig. 1. Relay Panel

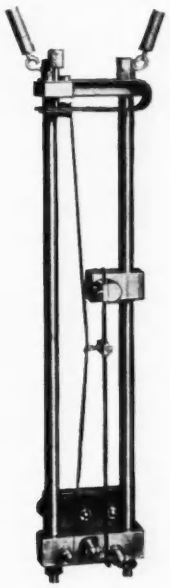


Fig. 2. Hair Control Unit

been a hammering of the relays due to small vibrations of the spring blade carrying the primary operating contact of the hair control unit, but in this apparatus this is eliminated by an efficient device incorporated in the relay panel.

The arrangements for humidifying or drying the atmosphere as dictated by the control apparatus depend on the conditions on site. One arrangement consists of two wooden "towers" fitted in the room or laboratory, one containing trays of calcium chloride, and the other, a bed of coke kept wet by a small stream of water. Each tower is fitted with an electric fan controlled by the relative relay of the humidity control outfit. When a fan is switched on by its relay, the air of the room is circulated through the "tower" till the humidity of the room is restored to the desired value, but while the fans are not working there is negligible wetting or drying effect due to the "towers."

A Miscellany of Laboratory Equipment

A New Design in Fortin Barometers

ONE of the disadvantages inherent in the Fortin barometer is that the fiducial point is viewed through the curved surface of a cylindrical glass cistern. As these cisterns are made from drawn glass tubing it is impossible to obtain a clear view of the point and its reflection at the moment of contact, owing to the existence of striae in the glass and to distortion of the image from the optically imperfect glass surfaces. The glass cistern is also rather delicate and easily damaged either through an accident in use or by tightening up the three fixing screws unevenly. Another serious defect in the usual pattern is that the measuring point is secured to the boxwood cistern and not to the actual metal scale of the barometer. In consequence any variation in the tightness of the three screws which hold the cistern in place will alter the distance from the point to the reading scale, thus introducing errors in the zero of the instrument. When the mercury in the cistern requires cleaning, the whole of the lower part has to be taken adrift by an expert and a new determination of the zero must be made when the instrument is re-assembled.

The new barometer introduced by Casella and Co., Ltd., not only obviates these defects, but is much more convenient to set and to read, is more robust, and can be cleaned by the user without dis-assembling. In this instrument the cistern is made of iron, the glass mercury tube being held in the upper portion by a ball and socket joint which allows the tube to take up its position in the centre of the metal frame quite free from strain. The screw is used for setting the surface of the mercury into contact with the zero point. This point is made from rustless steel firmly screwed and keyed into the metal frame, and therefore at an invariable distance from the divided scale. The cap contains a filter to purify the air which is drawn in and expelled from the cistern as the mercury rises and falls. This filter is designed to keep the mercury surface clean and free from impurities for an indefinite time even in the trying atmosphere of a chemical laboratory. It also allows the air to circulate freely into and out of the cistern so that the setting by the screw becomes dead beat and no time is lost in waiting for the mercury to settle down to its proper level. The measuring cistern may be emptied of mercury by lowering screw, and as it is again raised, the mercury percolates through a small hole in the base, which has the effect of removing any floating impurity. The point and its reflected image are viewed by means of an optical system which gives very perfect definitions under considerable magnification. The mercury surface may therefore be brought into contact with the measuring point with the greatest accuracy and ease, thus allowing a much quicker and more perfect setting to be made. The field of view is brilliantly illuminated by properly collimated light and the point and its reflection so clearly defined that settings can be repeated with an accuracy hitherto unobtainable. The adjustment of the barometer to the truly vertical is very readily effected, as it is only necessary when setting it up on the wall to rotate the frame about its vertical axis and adjust it by means of the three screws at the base until the point makes contact with the mercury in all positions.

The New Fortin Barometer.

Standard Humidity Tables

A SET of tables of relative humidity for use with artificially ventilated wet and dry bulb hygrometers has recently been published by Negretti and Zambra. The range of temperature is from 100° F. to 212° F. Dry bulb readings are set off on the left hand side of the table in steps of 2° F., and the depression of the wet bulb to the right, also in steps of 2° F. The tables are printed on both sides of a celluloid tablet which measures about 5 in. × 3½ in. There is a leatherette case to protect the tablet from damage when not in use. The figures have been derived from centigrade tables published by the National Physical Laboratory and these have been extrapolated to give a greater range. This completes a series of four similar sets of hygrometer tables, two on the centigrade scale, with upper limits of 50° and 100° C., and two on the Fahrenheit scale, one ranging from 20° F. to 120° F. and the other, as described above, from 100° F. to 212° F. They agree closely with the Assmann and the United States Bureau of Standards humidity tables. The arrangement of the figures is convenient, and the printing is not only very clear on the sample specimen but is also deep enough to ensure continued clearness even with constant use. At the highest temperatures on the Fahrenheit scale a depression of the wet bulb of 78° is provided for, the corresponding relative humidity at 194° F. being so low as 11 per cent.

Laboratory Filter Papers

EVANS, ADLARD AND CO., LTD., have been making filter papers for laboratory work in qualities to suit industrial purposes for upwards of 50 years, and their productions are stocked by all the leading wholesale laboratory furnishers. "Postlip" filter papers are supplied in sheets, circles, folded circles and rolls, and are fully described in a brochure which may be obtained on application to the firm. Grade 633B has a filtering capacity of 300 c.c. of water through a five inch circle in five minutes and is especially adapted for analytical work; grade 633C has a filtering capacity of 460 c.c. of water; 633D is a hard paper for the filtration of the finest precipitates. The ash left by these three grades in the case of a five inch circle is respectively 0.00184, 0.00171 and 0.00179 grams.

The ability of these filter papers to retain fine precipitates is conclusively demonstrated by a report of tests carried out at the National Physical Laboratory. A series of beakers containing equal volumes of a dilute sulphuric acid solution were taken, the contents raised to the boiling point, treated with barium chloride solution and after rapidly cooling, filtered through papers of Grade 633D and 633E and the corresponding grades of comparison paper. The filtrates were in each case perfectly clear and remained so on washing, the precipitates remaining on the filter papers. Another and more drastic test was carried out with 1 gram quantities of an alloy containing 82 per cent. tin and 10 per cent. antimony, treated with nitric acid evaporated to dryness, and then treated with 100 c.c. of 10 per cent. nitric acid and boiled. Without allowing the turbid solutions to settle, they were immediately poured into funnels fitted with the moistened papers. When the solutions had all passed through, the precipitates were washed. It was noted that papers of Grade 633D and 633E gave very slightly opalescent solutions, but the amount passed was of such small proportions that on long continued standing no precipitate would settle. In only one case was an absolutely clear filtrate obtained, *viz.*, in the case of a comparison paper similar to 633D. Speaking generally, no perceptible difference could be observed between the papers under test and those with which they were compared in their behaviour towards a solution containing one of the most difficult substances to filter met with in analytical practice. The amount of the oxides of tin and antimony so passed could be regarded as of no practical importance.

The Choice of Asbestos Cloth

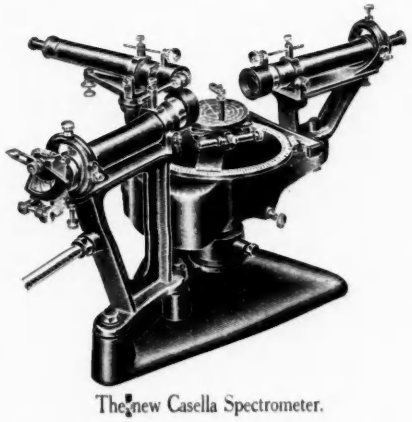
IN general there are two processes where asbestos cloth are used—as filter cloths, and as diaphragm cloths in electrolytic cells. The filtering of corrosive liquors is a common operation and it is the type of liquor which decides the kind of cloth to be used. If the liquor is acid blue asbestos cloth will be found suitable; it will also be found that there are other corrosive liquors where this cloth will give better results than white asbestos cloth. An instance of the superiority of

blue asbestos cloth is found in the manufacture of tartaric acid where a hot sulphuric-tartaric acid liquor has to be filtered. Here it is found that a good blue asbestos cloth withstands about 100 filtrations as against a small number in the case of a white asbestos cloth. For certain filtering processes in the sugar industry, however, white asbestos cloths are being successfully used. Apart from the resistance of the asbestos itself to the liquor under treatment, in selecting a suitable type of asbestos cloth for filtration operations, much of the success of the cloth depends upon the textile properties of the cloth itself. The weave, for instance, must be such that the cloth is capable of withstanding pressure without bursting. It is also essential that no organic fibres are incorporated with the asbestos, as is so often found with the ordinary commercial quality of asbestos cloth.

The use of asbestos cloth for electrolytic diaphragms is one which is growing very rapidly. In the production of synthetic ammonia, in those locations where cheap electric power is available, the hydrogen is obtained by the electrolysis of water and in these cells asbestos cloth is used as diaphragms to separate the gases. White asbestos cloth is generally used for this purpose, and here again the weave of the cloth is of enormous importance; generally speaking a "light tight" cloth must be used. In some types of chlorine-alkali cell an asbestos cloth diaphragm is also used, and in this case blue asbestos cloth has been found to give better results than white asbestos.

A New Spectrometer

FOR more than one hundred years Casella and Co., Ltd., have been manufacturing in London. Their new designs include a spectrometer, which, as the accompanying illustration shows, is solidly constructed and supported on a heavy cast-iron base. The telescope and prism table turn very easily on a central spindle, and are fitted with tangent screws. The circle is 8 in. diameter, divided on chromium plate, and the positions of the telescope and prism table are each read by two verniers. The circle may be rotated when required, thus allowing different parts of the dividing to be brought into use. Telescopes and collimator are fitted with coarse and



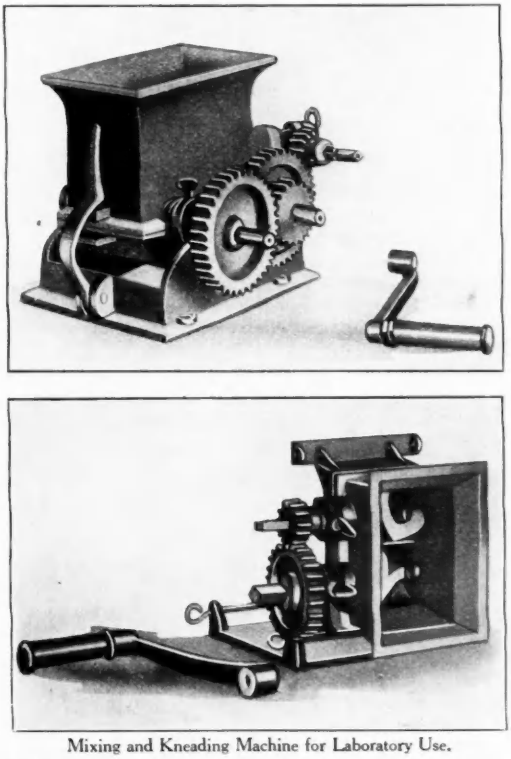
The new Casella Spectrometer.

fine focussing adjustments, and they are so mounted that they may be turned about a vertical axis over a range of 10°. They have the usual adjustments for collimation, and may be raised or lowered in relation to the prism table. The third telescope is mounted on the base, and may be clamped at any angle to the collimator. The slit is made on a new principle which allows the user to adjust the jaws to give results to a precision hitherto unobtainable. The jaws, which are of rustless steel, optically polished, are opened by a fine screw and closed by a spring, thus obviating any risk of damage. They are geometrically mounted on steel balls and are so arranged that they may be adjusted to exact parallelism. The adjustments also allow the front faces of the jaws to be brought to an optically plane surface. The length of the slit is regulated by means of a sector swinging in front of the jaws, whilst the design of this slit is such that jaws of any reasonable length can be made and adjusted to the highest possible precision.

Mixing and Kneading in the Laboratory

THE solution of new problems in mixing and kneading such as confront the chemical engineer from time to time is usually found to have been anticipated, except in detail, in the "Universal" machine originated many years ago by Baker Perkins, Ltd. Guesswork in mixing and kneading was eliminated by the invention of this machine, and although numerous modifications in design and construction have been made to keep abreast of the chemical engineers' requirements, the basic principle which established the "Universal" in the first place remains the heart of the machine to-day and is likewise the inspiration of all other Universal mixers. The principle involved consists of two blades of special design revolving at unlike speeds and in opposite directions in two hollow semi-cylinders the intersection of which forms a saddle-piece across which the ingredients are continually divided by the blades, the effect being to produce a perfectly homogeneous mixing of materials with the minimum expenditure of time and energy.

Originally the "Universal" machine was designed for the more efficient mixing and kneading of the ingredients of bread doughs, but it was apparent to the inventor that the principle



Mixing and Kneading Machine for Laboratory Use.

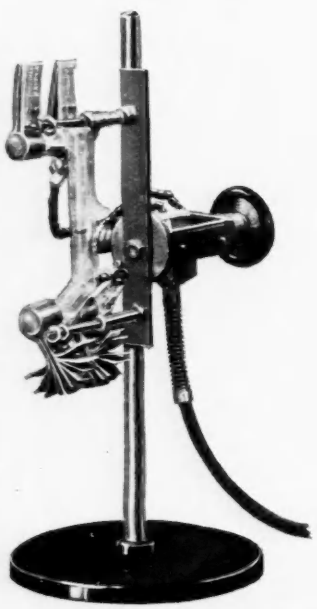
would find application in many circumstances where a similar physical action was required, and constant experiment has given rise to innumerable variations such as the set and shape of the blades and their relative speeds, the type of jacket and the method of discharging. To-day there is a big range of standard "Universals" with jacketed or partly jacketed troughs. In some cases the blades are hollowed for steam or water circulation. There are also special constructions for mixing under vacuum, and by a combination of variable features practically any requirement of the chemical engineer can be quickly met. Most recent developments, of course, have been special designs for the rubber, plastic and artificial silk trades, and as new problems arise, Baker Perkins, Ltd., continue their policy of experimenting to ascertain the particular application of the "Universal" principle will meet the case. The accompanying illustration shows a small machine which has been introduced to meet laboratory requirements, the material being mixed and kneaded to a consistency not greater than that of putty. A special feature of this machine is the ease with which it can be taken to pieces for cleaning.

Ultra-Violet Light Apparatus

FLUORESCENCE chemistry bids far to develop into an independent branch of research. The characteristic reactions, produced by exciting luminescence in any substance by ultra-violet rays, in many instances give immediate and specific information regarding its composition, but it is essential to have apparatus comprising a sufficiently powerful generator of the ultra-violet radiation, together with an efficient Wood's glass

The Hanovia Analytical Quartz Lamp

filter which will absorb all visible light and pass the exciting rays in sufficient intensity. In the Hanovia analytical lamp these essentials are combined in an apparatus which is at once simple, robust, and inexpensive. The ultra-violet source is a Hanovia mercury arc in quartz tube, enclosed in the light type casing, mounted above an open observation chamber, so that the filtered exciting ultra-violet rays fall vertically on the substance under test. The filter and screen can, of course, be withdrawn at will, so that the lamp becomes available as a source of ultra-violet rays for fading and ageing tests, spectrometry and other purposes which are summarised in an illustrated brochure "Rapid Testing by Fluorescence," which is sent post free on application to the manufacturers.

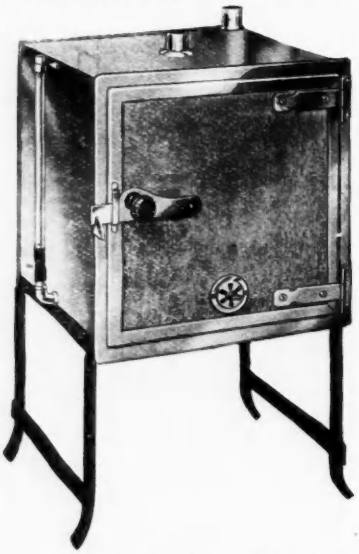


The U.V.S.A. Model Quartz Lamp for operation at any angle

Many forms of research also necessitate an efficient source of ultra-violet radiation, spectrometry, polarimetry, interferometry, being typical instances. In addition, ultra-violet lamps are increasingly in demand for commercial purposes such as vitamin-activation, rapid ageing tests and catalytic reactions. The British Hanovia Quartz Lamp Co., who specialise in ultra-violet apparatus, furnish a very practical series of scientific and commercial lamps. Most of these embody mercury arcs in quartz burners, designed in various forms for special application. For instance, their U.V.S.A. lamp, here illustrated, provides a source of high intensity, with the normal output characteristics of the mercury arc, which can be operated at any angle from horizontal to vertical or as an end-on point source. For special spectrographic investigations, similar burners can be provided which, in addition to the mercury arc characteristics, give superimposed spectra of other metals.

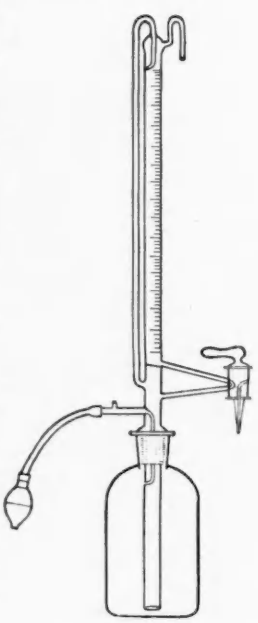
Stainless Steel Bench Tops

THE firm of J. W. Towers and Co., Ltd., undertakes the complete furnishing and equipment of industrial and educational laboratories. Bench tops of stainless steel can now be fitted and are preferred by some chemists to the more usual teak, asbestolite or opal glass, but the latter is specially recommended for titration benches and bacteriological laboratories. Stainless steel is also coming into use in the laboratory for water ovens, water baths, crucibles, basins, etc. The water oven illustrated is made of highly polished stainless steel with double-seamed joints and an asbestos covered door.



Laboratory Oven made of Stainless Steel

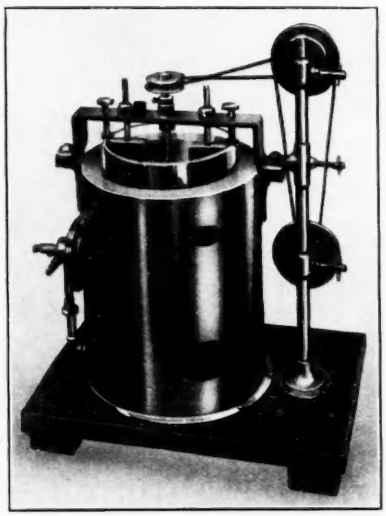
Standard interchangeable ground joints are now being manufactured by this firm and are being found of great convenience on all apparatus with ground joints. Each half of the joint is ground on a standard hard steel master tool to a uniform taper of 1 in 10, thus achieving absolute interchangeability. Among other pieces of apparatus recently brought out is the apparatus for testing the stability of benzole on storage, which is made according to the specification of the National Benzole Association. This firm also supplies a new and improved automatic burette which is of glass throughout, interchangeable ground joints being used instead of rubber stoppers, and has an unusual stopcock arrangement which permits any solution remaining in the burette to be returned to the bottle by turning the stopcock; it is also stronger than the ordinary pattern. One burette can be used with several bottles containing different solutions as the joints are interchangeable.



Improved Automatic Burette

Apparatus for Corrosion Tests

THE accompanying illustration shows an apparatus manufactured by Brown and Son (Alembic Works), Ltd., for the accurate gauging of corrosion by acids and other liquids on metals and other materials. The test pieces may be sheet strips, rods, tubes or irregular shapes. The apparatus consists of a gas heated water jacketed vessel, the container for



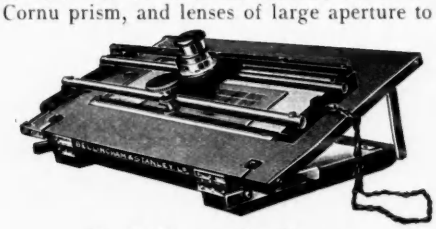
Apparatus for Corrosion Tests

corrosive liquid being of glass. Tests at various constant temperatures for any length of time are arranged by an adjustable and automatic thermostat. The test pieces are suspended from the crossbar, and a slow motion stirrer keeps the liquid in movement to ensure close and non-insulated contact. The jacket may be used as a water cooling device by circulation in cases where heat is generated in the process.

New Spectroscopic Instruments

NEW instruments have been introduced by Bellingham and Stanley, Ltd., during the last twelve months, in connection with spectrometric investigations, photometry, and the measurement of rotatory dispersion. The well-known B-S direct reading spectrometer has been re-designed so as to make the instrument even more generally useful for investigations, not only over the visible spectrum but in the infra-red and ultra-violet. This is the only instrument of its kind which can be so easily arranged to use prisms of either rock-salt, glass or quartz.

An entirely new design of monochromatic illuminator for the ultra-violet has also been introduced; this is fitted with a quartz Cornu prism, and lenses of large aperture to give the



The B-S Spectrum Plate Measurer

greatest light intensity in the ultra-violet. A novel feature of the instrument is the method which has been adopted to bring any required radiation upon the exit slit. Between the prism and telescope lens a pair of deflecting prisms are mounted which rotate in opposite directions by means of extremely accurate gearing. The angle and position of these prisms are arranged to give additional dispersion over the less refrangible region of the spectra while decreasing the dispersion of the ultra-violet, by this means the calibration curve for wavelength measurement approaches a straight line, and the divisions on the drum indicating the wavelength of the light being used are nearly uniform. The illuminator really consists of two instruments, the first serving to give a preliminary analysis of the light, while the second gives the required dispersion. When required the two instruments can be separated and either used as a single but complete instrument.

Attention has also been given to various methods at present being used for quantitative estimation of impurities in alloys, and particularly to the estimation of bismuth in copper. Bellingham and Stanley, Ltd., have developed apparatus for this work and are obtaining results, which are not only accurate but which are obtained far quicker than can be obtained by chemical methods.

All spectrographs made by Bellingham and Stanley, Ltd., are now fitted with a new symmetrically opening slit which allows of any other apparatus such as a rotating sector being brought up to within $\frac{1}{2}$ mm. of the slit jaws. The measurement of spectrum plates has also been receiving attention, and two instruments have been introduced for this work, which are not only of simple construction but inexpensive. The B-S spectrum plate measuring instrument, which is illustrated, accommodates plates up to 10 in. x 4 in. and reads to 0.02 mm. an accuracy amply sufficient for most purposes. The supporting table can be used either in the horizontal or inclined position. The scale and vernier are of rustless iron, and the movement of the eyepiece is by means of a friction drive giving an extremely smooth and accurate motion. The optical system is designed to eliminate all parallax between the pointer and the spectrum line under examination.

A New Low-Price Balance

THE economy of low prices, combined with a corresponding loss of quality, is a false saving, for, though the life of the commodity may be in proportion, the satisfaction gained is never consistently so great, and the impression left by the commodity is one of indifference and non-conviction. To combine a real economy of price and the maintenance of a high quality, rendered possible by keener buying, modifications in design, and elimination of superfluities, is to effect a true and lasting economy, without any sacrifice of satisfaction or pleasure. This result has been admirably achieved

The "Bybryt" Analytical Balance

by William A. Webb, Ltd., in the production of their "Bybryt" analytical balance, which is a product of high quality and excellent achievements, but remarkably low in price. To any desiring a sound, reliable British balance, at an extremely modest outlay, this instrument well merits very serious attention. This is but one product of a concern which has for many years seriously interested itself in the production of reliable balances.

A New Colloidal Cleaner

Economical Degreasing

THE British Hydrological Corporation announce the marketing of B.H.C. colloidal cleaner. The particular application of this colloidal compound is to the plating industry and it has been produced specifically to fill the need for an efficient and economical degreasing method. Eight months of laboratory experiments and six months of testing under practical conditions have culminated in the product. For the past six months it has been used exclusively in some of the largest cycle and motor works in the country.

As a colloid it possesses exceptional wetting power. It is, therefore, able quickly and certainly to penetrate the layer of grease and wax with which the metal is coated and having done so to ensure the removal of the bulk of it. Its scrubbing action then operates and completes the removal of those tiny particles which, if not removed, play such havoc with the plating layer. It is used normally in a 5 per cent. w/w solution at boiling point and it has been found that the working life of the solution is longer than that of other compounds by reason of the fact that the grease, dirt, etc., is held in suspension in the liquor. Instant rinsing of the metal is obtained by reason of its colloidal nature so that no alkali remains behind to cause subsequent stripping. A free testing quantity of the new product may be had from the British Hydrological Corporation, High Path, London, S.W.19.

Coal Distillation

Proposed New Plants in Mining Centres

PLANS for a large-scale expansion of the coal distillation industry in Great Britain are stated to be in preparation. If these plans are carried into effect, plants for the production of smokeless fuel and coal-oil by low-temperature carbonisation will be established in suitable mining centres throughout the country. This scheme is being put forward as a result of the official encouragement given by contracts recently placed for coal-oil and coal-petrol for the Admiralty and Royal Air Force, and by the announcement in Parliament that the Navy would be prepared to take as much of the new coal-oil as could be supplied. Another reason is the increasing domestic demand for smokeless fuel.

No definite information is available as to whether the additional plants are to be erected. Exhaustive tests, however, have been carried out by Low Temperature Carbonisation, Ltd., and the Fuel Research Board with coal selected from a number of collieries throughout the country, and a very large proportion of these have proved suitable. Recently two batteries of seventy-two retorts were added to the works of Doncaster Coalite, Ltd., at Askern, which now possesses the largest low-temperature carbonisation and coal-oil plants in the world.

Glass Autoclaves for Laboratory Use

A GLASS autoclave enabling valuable data to be collected in connection with such operations as the treatment of sulphite wood pulp has been described by G. Klein ("Chemische Fabrik," 1932, No. 23, page 205). Improvements have now been effected by Gerngross, Hoffmann and Klein, a description and illustrations of the new model appearing in a recent issue of the same journal (1933, No. 8, page 93). Special Jena pressure-proof glass is employed in the construction of the reaction chamber which is of 750 c.c. capacity, and the whole apparatus is so designed that the asbestos packing rings need not be removed when it is desired to remove or introduce material after an experiment. Another interesting feature about the apparatus (which has stood up to a temperature of 170° C. at 7 atmospheres pressure over long periods) is the copper jacket which can be filled with a suitable heating liquid and which is fitted with two large glass observation windows.

Society of Chemical Industry

Annual Meeting of the Plastics Group

THE first annual general meeting of the Plastics Group of the Society of Chemical Industry was held on Wednesday, April 26, at the Science Museum, South Kensington (where the Plastics Exhibition is being held). Mr. H. V. Potter, chairman of the Group, presided. The report of the hon. secretary, Mr. A. Lowe, recalled that the Group was formed on March 11, 1932, and a temporary committee managed its affairs from July until the inaugural meeting held on October 12, when that committee was asked to continue in office until the first annual meeting, with power to add to its numbers within prescribed limits. The executive was made as representative as possible of every branch of the industry. The original membership of 27 had increased to 86.

The Group has accepted an invitation to contribute a full session at the annual meeting of the Society, in Newcastle, on July 12. Dr. Rassow will present the principal paper at that session. In co-operation with the Department of Scientific and Industrial Research and the British Plastic Moulding Trade Association, the Group has taken a large share in organising the Plastics Exhibition now being held in the Science Museum.

The following were re-elected by the committee to fill the offices indicated. Chairman, Mr. H. V. Potter; vice-chairman, Dr. L. A. Jordan; hon. treasurer, Mr. C. Chapman; hon. secretary, Mr. A. Lowe.

Following the formal business, two cinematograph films were shown, one dealing with the manufacture of gun-cotton, and the other with the production and uses of bakelite. These films were shown by the courtesy of I.C.I., Ltd., and Bakelite, Ltd., respectively, to whom a vote of thanks was accorded. A special session is to be arranged later for the exhibition of a film dealing with carbon black.

Production of Wood Sugar

Factory Erected in Germany

PROFESSOR BERGIUS'S system for making sugar out of wood is reported to have found its first complete practical realisation in a factory erected at Mannheim-Rheniau, which will be followed by others on the same model in other countries. German scientific opinion tends to the belief that the original laboratory experiments have reached the stage which puts a new cheap foodstuff within reach of the masses. The wood is ground very finely, dried out, and treated with highly concentrated hydrochloric acid. This is the elementary stage of the sugar, which can be used as fodder in this form, but is capable of being refined to a considerable extent and at the same time produces such by-products as can be compressed and used for fuel.

Refresher Courses for Chemists

A Small but Steady Demand

A SCHEME for specialised lectures in chemical subjects at Yorkshire technical schools and colleges to serve as "refresher" courses for chemists, was outlined by Dr. F. A. Mason, *Government Inspector of Technical Schools*, at a meeting of the Yorkshire Council for Further Education, held at the Leeds Education Offices, on April 24.

Dr. Mason pointed out that it had been the custom in past years for the larger technical colleges to offer courses of lectures for adult students, dealing with advanced and highly specialised portions of chemistry and chemical technology. It had been found that there was a small but steady demand from chemists of mature years for what might be regarded as "refresher courses" in their special subjects, followed with a view to bringing their knowledge up to date.

THE Fourteenth Exposition of Chemical Industries at New York, U.S.A., will include a section especially devoted to the brewing industries, their processes and equipment. The exposition occurs during the week commencing December 4, 1933, and three floors of Grand Central Palace have been reserved. Over 150 companies have contracted for space at the exposition.

News from the Allied Industries

Coal Distillation

GOVERNMENT OFFICIALS paid a special visit to the Askern plant of Doncaster Coalite, Ltd., on April 25, to inspect the coal distillation plant.

China Clay

THE CHINA CLAY TRAFFIC for March showed considerable improvement, the total shipments being just 20,000 tons above those recorded for February, and 5,000 tons better than January although the year opened favourably. To have shipped nearly 170,000 tons in the first quarter of the year with the principal market, the United States, still in a state of unsettlement, is no mean achievement. With the adjustment, however, of those economic problems which have been retarding our commercial relations with the Continent and America there is every hope of a better year's trade. The details of shipments are as follows: Fowey, 41,167 tons of china clay; 1,848 tons of china stone; 398 tons of ball clay; Par, 8,717 tons of china clay; 1,121 tons of china stone; Charleston, 5,041 tons of china clay; 11 tons of china stone; Penzance, 1,910 tons of china clay; Looe, 299 tons of china clay; Plymouth, 175 tons of china clay; Newham, 58 tons of china clay. By rail to destination, 5,458 tons of china clay, making a total of 62,825 tons of china clay; 2,980 tons of china stone; 398 tons of ball clay, compared with 43,179 tons of china clay, 998 tons of china stone, 747 tons of ball clay in February.

THE ENGLISH CHINA CLAYS, LTD., have addressed a letter to its shareholders, dated April 18, informing them that there will be an unavoidable delay in the holding of the annual meeting, owing to recent amalgamation, but that the meeting will probably be held before June 30, this year.

Mineral Oil

IT IS DENIED by the Persian Legation in London that any agreement has been reached between Sir John Cadman and the Persian Government under which the Anglo-Persian Oil Co. would obtain concessions in a new Persian oilfield. The latest available information is that the Persian Government's proposals had been submitted to Sir John Cadman, who was considering them, but that their tenor had been kept strictly secret.

Paper

PLANS FOR THE ESTABLISHMENT of a new industry—the manufacture of damp-proof transparent wrapping-paper of a kind hitherto imported from the Continent—have been completed, and production will start this summer at St. Helens, Lancashire. One of the directors of the company responsible—British Sidac, Ltd.—is Lieut.-Com. Kenworthy. About eighty people are already employed at St. Helens and in London on preparatory work. The factory of the Nuera Artificial Silk Co., which has been idle for about two years, has been acquired, together with the up-to-date viscose plant originally intended for silk production. The installation of the special machinery for the manufacture of transparent paper from the viscose will be started next month. The new industry is the outcome of an agreement between a Belgian company—Société Industrielle de la Cellulose, of Ghent—and British interests, who will provide part of the capital. The Belgian company, which also has factories in Italy and America, has been importing large quantities into this country. Under the new agreement, for which the tariff is largely responsible, this demand, as well as that for the rest of the British Empire, will be supplied from the St. Helens factory.

Prices of Chemical Products

Current Market Conditions

THE London chemical market is receiving a fair volume of inquiry with business about up to the general average of the past few weeks. With practically no exception markets are firm with the undertone strong. The Manchester chemical market seems to have settled down after the Easter holiday and operations during the past week have been on about the scale experienced prior to the stoppage. Deliveries into consumption against old contracts have been resumed on a fairly satisfactory scale. Business in the Scottish heavy chemical market still remains quiet. Quantities asked for are mostly small and for immediate delivery. With the following exceptions, the prices of chemical products remain as reported last week (pp. 370-371).

General Chemicals

ACID, TARTARIC.—11d. per lb. SCOTLAND: B.P. crystals, 10½d., carriage paid. MANCHESTER: 11d.

ARSENIC.—LONDON: £19 c.i.f. main U.K. ports for imported material; Cornish nominal, £23 f.o.r. mines. SCOTLAND: White powdered, £25 ex wharf. MANCHESTER: White powdered Cornish, £23 at mines.

LEAD ACETATE.—LONDON: White, £34 per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £36; brown, £1 per ton less. MANCHESTER: White, £32 10s.; brown, £30.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £40 to £42.

Pharmaceutical and Fine Chemicals

PHENACETIN.—4s. 6d. to 4s. 9d. per lb.

POTASS. BITARTRATE, 99/100% (cream of tartar).—80s. per cwt.

TARTAR EMETIC B.P.—3s. 9d. to 4s. 6d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 10d. per lb.; crude, 60's, 1s. 11d. to 2s. per gal.; 2% water, 3s. 0¼d. MANCHESTER: Crystals, 9½d. per lb.; crude, 2s. 6d. per gal. SCOTLAND: 60's, 1s. 7d. to 1s. 8d.

CREOSOTE.—B.S.I. Specification Standard, 2½d. per gal. f.o.r. Home, 3⅜d. d/d. LONDON: 3d. to 3¼d. f.o.r. North; 4d. to 4¼d. London. MANCHESTER: 2¾d. to 3¼d. SCOTLAND: Specification oils, 3¾d. to 4¼d.; washed oil, 4d. to 4½d.; light, 3¼d. to 4¼d.; heavy, 4¼d. to 5d.

PITCH.—Medium soft, £4 5s. to £4 10s. per ton. MANCHESTER: £4 to £4 7s. 6d. f.o.b. LONDON: £4 5s. to £4 10s. f.o.b. East Coast port.

TOLUOL.—90%, 2d. per gal.

German Professors Resign

Sequel to Dismissal of Jews

PROFESSOR H. FREUNDLICH, the famous colloid chemist, and Professor M. Polanyi, the eminent physical chemist, have resigned from their positions in the Kaiser Wilhelm Gesellschaft in Berlin. Professor Freundlich and Professor Polanyi were leaders of departments in the well-known Institute for Physical Chemistry at Dahlem, Berlin. Neither of these professors was under compulsion to resign, as Professor Polanyi had served in the war and Professor Freundlich was an eminent official before 1914. Their resignations followed on the dismissal of Jewish employees in their laboratories.

Both Freundlich and Polanyi have followed the lead of Professor Franck, of Göttingen, the Nobel Prize physicist, who served with distinction in the German Army, and who also had found it impossible to continue to direct a famous scientific laboratory.

Swedish Paper Pulp Industry

SWEDISH commercial and industrial life suffered increasingly during the year 1932 from the general depression, intensified by the results of the Kreuger crash, which was felt particularly on the capital market and in the banking world. Nevertheless powers of resistance still proved to be astonishingly great, which may be ascribed in some measure to the favourable effects of the depreciation of the Swedish krona. According to the "Swedish Economic Review," compiled by the Swedish Board of Trade, the export of paper pulp, which was still fairly well maintained during 1931—partly as a result of the increased production capacity of the sulphate industry—deteriorated considerably during 1932. The decline, which amounted to 18 per cent. for the whole pulp export, affected all sorts of paper pulp. Prospects for the current year seem better than last year in so far as the position of stocks for the paper pulp industry is very favourable. Sales for delivery in the present year have not been particularly brisk, with the exception of wet mechanical pulp, for which 70 to 75 per cent. of the estimated production for 1933 had been placed at the turn of the year.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

MANUFACTURE OF ORGANIC BASES.—Dr. L. Lilienfeld. July 4, 1931. 390,516.

MANUFACTURE OF CELLULOSE COMPOUNDS AND OF ARTIFICIAL MATERIALS THEREOF.—Dr. L. Lilienfeld. July 4, 1931. 390,519.

TETRAKISAZO DYESTUFFS.—Imperial Chemical Industries, Ltd., and C. Paine. Sept. 4, 1931. 390,529.

MANUFACTURE OF ACETALDEHYDE.—H. Dreyfus. Oct. 5, 1931. 390,506.

DYEING WITH VAT DYESTUFFS.—J. Morton, J. E. G. Harris and Morton Sundour Fabrics, Ltd. Oct. 5, 1931. 390,513.

SOFTENING, PLASTICISING, AND LIKE AGENTS AND PROCESSES. Deutsche Hydrierwerke Akt.-Ges. Oct. 7, 1930. 390,534.

DYEING OF TEXTILES.—A. G. Bloxam (Soc. of Chemical Industry in Basle). Oct. 24, 1931. 390,553.

MANUFACTURE OF NITRO COMPOUNDS OF THE DIPHENOL SERIES.—A. Carpmael (I. G. Farbenindustrie). Nov. 3, 1931. 390,556.

MANUFACTURE OF LEATHER CLOTH AND THE LIKE COATED FABRICS.—Imperial Chemical Industries, Ltd. (E. I. Du Pont de Nemours and Co.) March 18, 1932. 390,628.

PROCESS OF AND APPARATUS FOR THE CONCENTRATION OF SULPHURIC ACID TO A HIGH DENSITY.—Appareils et Evaporateurs Kestner. March 26, 1931. 390,634.

PROCESS AND APPARATUS FOR THE RECOVERY OF THE CONSTITUENTS OF PHOTOGRAPHIC FILM MATERIAL.—R. Spelling. May 22, 1931. 390,664.

FUNGICIDES, INSECTICIDES, AND THE LIKE.—Grasselli Chemical Co. Oct. 1, 1930. 390,521.

PRODUCTION OF POTASSIUM CARBONATE.—Kali-Chemie Akt.-Ges. Sept. 29, 1931. 390,704.

PRODUCTION OF SODIUM METAPHOSPHATE SUITABLE FOR USE IN BAKING POWDERS.—Chemische Fabrik Budenheim Akt.-Ges. Oct. 10, 1931. 390,743.

RINSING, CLEANSING, AND FAT-REMOVING AGENTS.—H. D. Elkington (Chemische Fabrik Budenheim Akt.-Ges.) Oct. 19, 1932. 390,751.

PRODUCTION OF PROPIONIC ACID BY FERMENTATION.—Commercial Solvents Corporation. June 29, 1932. 390,769.

PROCESS FOR THE MANUFACTURE OF THERAPEUTIC COMPOUNDS OF THE HETEROCYCLIC SERIES.—A. Carpmael (I. G. Farbenindustrie). Sept. 3, 1931. 390,831.

PROCESS FOR REFINING FATTY OILS.—B. Clayton. Sept. 7, 1931. 390,805.

MANUFACTURE OF ALIPHATIC ANHYDRIDES.—H. Dreyfus. Sept. 30, 1931. 390,845.

CONVERSION OF HYDROCARBONS INTO OTHER HYDROCARBONS OF LOWER MOLECULAR WEIGHT.—H. Dreyfus. Oct. 1, 1931. 390,846.

PROCESS AND APPARATUS FOR PERFORMING CHEMICAL REACTIONS.—H. Dreyfus. Oct. 2, 1931. 390,847.

PRODUCTION OF HYDROGEN AND CARBON MONOXIDE.—Hydro Nitro Soc. Anon. Oct. 3, 1930. 390,849.

CARRYING OUT OPERATIONS WITH AMMONIA AT ELEVATED TEMPERATURES.—E. I. Du Pont de Nemours and Co. Oct. 7, 1930. 390,809.

COLOURATION OF TEXTILE MATERIALS.—British Celanese, Ltd., G. H. Ellis, H. C. Olpin, and W. B. Miller. Oct. 9, 1931. 390,819.

PROCESS FOR TREATING CELLULOSIC FIBRES WITH ALKALINE LIQUIDS.—G. E. Collins, G. T. Morgan and D. D. Pratt. Oct. 10, 1931. 390,824.

CONCENTRATION OF ALIPHATIC ACIDS.—H. Dreyfus. Oct. 10, 1931. 390,825.

TREATMENT OF TEXTILE MATERIALS WITH LIQUIDS.—British Celanese Ltd., W. A. Dickie and P. F. C. Sowter. Oct. 12, 1931. 390,861.

RECOVERY OF ETHYLENE.—G. F. Horsley and Imperial Chemical Industries, Ltd. Oct. 13, 1931. 390,863.

PRODUCTION OF AN INFLAMMABLE OR DIFFICULTLY-INFLAMMABLE SOLUTION OF NITROCELLULOSE.—A. Eichengrün. Oct. 20, 1930. 390,867.

PRODUCTION OF NITROGEN OR HYDROGEN-NITROGEN MIXTURES.—E. H. Salisbury and Imperial Chemical Industries, Ltd. Oct. 20, 1931. 390,870.

PRODUCTION OF FILMS, FOILS, SHEETS, OR THE LIKE.—Celluloid Corporation. Jan. 7, 1931. 390,899.

MANUFACTURE OF CONDENSATION PRODUCTS OF ALDEHYDE AND KETONES.—H. Langwell, J. E. Youell, and British Industrial Solvents, Ltd. Jan. 19, 1932. 390,905.

UNITING COMPOSITIONS OF OR CONTAINING RUBBER OR THE LIKE TO METAL.—Dunlop Rubber Co., Ltd., D. F. Twiss, J. A. Wilson, and A. E. T. Neale. March 1, 1932. 390,932.

PRODUCTION OF BLEACHING POWDER.—A. L. Mond (I. G. Farbenindustrie). Dec. 17, 1932. 391,078.

PROCESS FOR THE MANUFACTURE OF COPPER COMPLEX COMPOUNDS OF POLYAZO DYESTUFFS.—I. G. Farbenindustrie. March 9, 1931. 390,936.

PROCESS FOR RAISING THE IMPACT BENDING STRENGTH OF ACETYL CELLULOSE MASSES MOULDED BY INJECTION.—Dr. F. Schmidt. July 30, 1931. 390,977.

PROCESS FOR THE MANUFACTURE OF AMMONIUM SALTS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. July 8, 1931. 390,980.

PRODUCTION OF THE ANHYDRIDES OF VOLATILE FATTY ACIDS.—Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler, H. Walter and H. Schulz. July 15, 1932. 390,987.

PROCESS FOR THE MANUFACTURE OF TERPENES.—Schering-Kahlbaum A.-G. Dec. 18, 1931. 391,073.

ORGANIC BASES.—Dr. L. Lilienfeld. July 4, 1931. 390,523.

MANUFACTURE AND PRODUCTION OF ASSISTANTS FOR THE TEXTILE AND ALLIED INDUSTRIES.—J. Y. Johnson (I. G. Farbenindustrie). Sept. 28, 1931. 390,840.

Applications for Patents

TRANSFERRING LIQUEFIED GASES FROM ONE VESSEL TO ANOTHER.—Naamlooze Vennootschap Machinerieën-en Apparaten Fabrieken. April 4. (Germany, May 12, '32.) 10105, 10106 (cognate with 10105).

MAGNESIUM BASE ALLOYS.—W. J. Tennant (Dow Chemical Co.). April 8. 10565, 10566.

MANUFACTURE OF 3-METHYLAL-PENTANE AND 3-METHYLOL-PENTANE. Dr. A. Wacker Ges. für Elektrochemische Industrie Ges. April E. (Germany, April 12, '32.) 10466. (Germany, 26, '32.) 10467. (cognate with 10466).

CARRYING OUT CATALYTIC REACTIONS.—J. Y. Johnson (I. G. Farbenindustrie). April 8. 10557.

MANUFACTURE OF CONDENSATION AND POLYMERISATION PRODUCTS OF HYDROCARBONS.—J. Y. Johnson (I. G. Farbenindustrie). April 5. 10219.

MANUFACTURE OF ISO EUGENOL VANILLIN, ETC.—A. Boake, Roberts and Co., Ltd. April 11. 10830.

SYNTHETIC RESINS, ETC.—British Celanese, Ltd. April 13. (United States, April 16, '32.) 11042, 11043.

CELLULOSIC COMPOSITIONS.—British Celanese, Ltd. April 13. (United States, April 16, '32.) 11044, 1045.

PLASTIC MATERIALS.—British Celanese, Ltd. April 13. (United States, April 13, '32.) 11201.

CARBON-MONOXIDE GAS DETECTOR.—R. A. Clarke. April 12. 10883.

MANUFACTURE OF ETHYL ALCOHOL.—Distillers Co., Ltd., J. B. Dymock and W. P. Joshua. April 11. (Jan. 29, '32.) 10818.

RESINOUS MATERIALS.—E. I. Du Pont de Nemours and Co. April 13. (United States, April 16, '32.) 11169.

MANUFACTURE OF EASILY SOLUBLE SALTS OF SULPHURIC ACID ESTERS OF LEUCO-VAT-DYESTUFFS.—Durand and Huguenin Akt.-Ges. April 12. (Germany, April 18, '32.) 10935.

PREPARING SAND MOULDS FOR CASTING MAGNESIUM, ETC.—I. G. Farbenindustrie and J. Y. Johnson. April 10. (Germany, April 27, '32.) 10703.

SEPARATION OF CARBONIC ACID FROM GASES.—I. G. Farbenindustrie. April 10. (Germany, April 12, '32.) 10717.

MANUFACTURE OF ANHYDROUS ALKALI SULPHIDES.—I. G. Farbenindustrie. April 10. 10718.

PROCESS OF IMPROVING CELLULOSE DERIVATIVES.—I. G. Farbenindustrie. April 11. (Germany, April 11, '32.) 10805.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. April 12. (Germany, April 12, '32.) 10937.

HYDROGENATION OF FATS, ETC.—I. G. Farbenindustrie. April 12. 10940.

MANUFACTURE OF CARBAZOLE COMPOUNDS.—I. G. Farbenindustrie. April 12. (Germany, April 13, '32.) 10959, 10960, 10961.

MANUFACTURE OF DYESTUFFS OF THE GALLOCYANINE SERIES.—I. G. Farbenindustrie. April 13. (Germany, April 14, '32.) 11103.

DYESTUFFS.—I. G. Farbenindustrie. April 13. (Germany, June 24, '32.) 11108.

ALKYL-MERCURY-MERCAPTO-COMPOUNDS.—I. G. Farbenindustrie. April 13. (Germany, April 16, '32.) 11109.

INDIGO DERIVATIVES.—Imperial Chemical Industries, Ltd. April 10. 10734.

PRODUCTION OF DERIVATIVES OF RUBBER.—Imperial Chemical Industries, Ltd. April 10. 10735.

ALIPHATIC ACIDS.—Imperial Chemical Industries, Ltd. April 13. 11191.

MANUFACTURE OF CARBOXYLIC ACID ARYLIDES.—J. Y. Johnson (I. G. Farbenindustrie). April 10. 10679.

From Week to Week

MR. HUGH KERR, Loanhead, managing director of the Eldin Chemical Co., who died recently, left £12,171.

DR. E. LESLIE BURGIN, M.P., Parliamentary Secretary of the Board of Trade, will open a new plant for the manufacture of titanium pigments, at the works of B. Laporte, Ltd., and National Titanium Pigments, Ltd., Luton, on Wednesday, May 10.

MR. ALFRED BENNET, of Roseville, Barrow Green Lane, Widnes, died on April 15, at the age of 81. Mr. Bennet had been manager at the Pilkington Sullivan works of the United Alkali Co. (now Imperial Chemical Industries, Ltd.), whence he retired in 1917.

FLAGS WERE FLOWN on April 21 at Wiggins, Teape and Co.'s Devon Valley paper mills at Hele, in honour of the marriage at St. Martin-in-the-Fields, London, that day, of the manager, Mr. H. M. Richardson, to Miss Constance M. Crowther, daughter of Captain W. R. D. and Mrs. Crowther.

AS THE RESULT OF FALLING INTO A TANK OF ACID at the Whitehead Torpedo Works, Weymouth, James Dunn (54), of Weymouth, died on April 20. Dunn, a labourer, was engaged in dipping parts of a torpedo in the tank of acid to clean them. Presumably, he lost his balance, and fell into the tank head first. His cries attracted fellow-workmen, who hauled him out, but he collapsed and died shortly after his admission to hospital.

A NEW PROCESS for the production of a cattle-feeding stuff from whale meat has, according to "Aftenposten," Oslo, been invented by a Norwegian, Mr. Johs. Nygaard, and is now being tried out on a small scale on board a floating factory-ship in the Antarctic. The process is stated to aim at the elimination of all water from the whale meat, turning it into a fine powder, rich in proteins, and capable of withstanding transport through the tropics.

AN ADVISORY SUB-COMMITTEE of the City and Guilds of London Institute was appointed some time ago to formulate a suggested course of study and syllabuses for examinations by the Institute in electrodeposition of metals as a separate subject. The sub-committee has now completed its task, and the new scheme has been adopted by the Institute for inclusion in the department's programme for the session 1933-4; it has also been published in pamphlet form.

CONTROL OF THE CHEMICAL INDUSTRY, as an important factor in the solution of the armaments problem, was advocated by Dr. Roy Strathdee, of the Chemistry Department, Aberdeen University, in an address to Aberdeen Rotary Club. Dr. Strathdee said that of all the armaments known in modern times, the bayonet was the only one that did not depend for its maintenance upon chemicals. The real roots of war were nurtured on chemical manufactures. If they were to get any solution to the armaments problem it must be by getting some control over the chemical industry.

THERE IS LITTLE POSSIBILITY OF PRODUCING PETROL from coal to compete successfully with imported petrol at its present cost, declared Professor J. Neville Moss, of the mining department of Birmingham University, when he spoke in Birmingham on Monday. The best thing that could be done was to produce petrol from coal at a cost of about 9d. or 10d. a gallon, as against the price of imported petrol of about 2d. per gallon. The use of coal in a pulverised form, and possibly of compressed coal dust for motor vehicles had the greatest future of any of the processes, and before long he believed many motor vehicles would be driven on coal dust.

A PAINT WHICH IS SAID TO PRODUCE a metal primer that affords exceptional protection against atmospheric conditions and mild solutions of acids, alkalies, and brines, when mixed with any normal oil paint vehicle has been developed by the Eastern Mabelite Corporation. This pigment is produced by using mabelite ore, which contains a suitable conglomerate of ferric oxide, silica, and aluminium, and putting it through a new grinding process that more finely regulates the pigment particle size. The coating, which combines an iron oxide sand-coat finish, is claimed to be resistant to mechanical injury. Successful application, it is said, has been made to metal pipe lines, tanks and concrete.

THE CAUSE OF SMOKE ABATEMENT should be enhanced by the reprinting of John Evelyn's pamphlet "Fumifugium," which was first published in 1661 by the National Smoke Abatement Society, 23 King Street, Manchester, 2. Although atmospheric pollution in the Metropolis and other cities no longer approaches "Hellish and dismall Clowd of Sea-coale" which Evelyn noticed issuing from the precincts of the Palace of Whitehall, there is still much work to be done before grime disappears from our buildings and unadulterated sunlight pours down upon densely crowded centres of population. Single copies of the paper-covered edition are sixpence, and cloth-bound copies are also available at 1s. 6d.

MR. RICHARD SPIERS, chemist at the Pumpherson Oil Refinery, Pumpherson, who is leaving to take up an appointment in Abadan, received a presentation from the staff last week to mark his departure.

RICH OIL HAS BEEN FOUND in the Italian concession in Albania according to the Chemische Fabrik of March 22. The available quantity is estimated to be sufficient to meet Italian requirements. A pipe line is planned from the new field to Valona.

OWING TO AN ACCIDENT, Professor L. Ruzicka, professor of organic chemistry in the Technical High School, Zurich, will be unable to deliver his lectures on "The High Membered Carbon Rings" and "The Constitution of the Polyterpenes," arranged to be given at University College on May 9 and 11.

DORMAN LONG AND CO. have secured the contract for the construction of Fulham power station. The contract will involve 19,000 tons of steelwork, all of which will be manufactured at Middlesbrough. The value of the contract is about £400,000 and the whole of the steelwork has to be supplied and erected within 39 weeks.

THE PRODUCTION OF SYNTHETIC AMMONIUM SULPHATE in Japan in 1932 is reported to have reached an amount of 732,000 tons, which is 107,000 tons more than for 1931, *i.e.*, 625,000 tons. In addition, about 50,000 tons of by-product ammonium sulphate were produced, consequently the total production is estimated at 782,000 tons, and thus a position of self-supporting in Japan is almost attained.

NEGOTIATIONS ARE TAKING PLACE between Imperial Chemical Industries, Ltd., and Mr. E. R. Foden, formerly managing director of Foden's motor-wagon works, Sandbach, regarding the taking over of disused works at Cledford, Middlewich. Mr. Foden, who resigned last year from the firm which was founded by his late father, proposed to start in the engineering business on his own account and to make a smaller type of road vehicle. Mr. Foden said he hoped to come to some decision by the week-end.

DR. LYMAN J. BRIGGS has been appointed director of the U.S. Bureau of Standards, in succession to Dr. G. K. Burgess, who died on July 2, 1932. Dr. Briggs has been chief of the Division of Mechanics and Sound of the Bureau since 1920. He has carried out much research on aerodynamics, gyroscopic stabilisation and properties of liquids. He is the co-inventor, with Dr. Paul R. Heyl (also of the Bureau of Standards), of the earth inductor compass that is now widely used in aircraft.

SOME TIME AGO the University of Bombay decided to start the Department of Chemical Technology and made a grant of £37,500 for that purpose. A scheme was drawn up and after considerable discussion was adopted. A select committee was then appointed to recommend the best candidate from among applicants for the head and director of the institute. The committee finally selected Dr. Forster as head of the institute and his appointment has been sanctioned by the Syndicate.

AN INFORMAL DINNER of the members of the Bristol section of the Institute of Chemistry, was held at Bristol in honour of Mr. A. W. M. Wintle, F.I.C., who is about to leave Bristol to take up an appointment at Widnes. The chair was occupied by Mr. Edward Russell, Public Analyst of Bristol. A presentation was made to Mr. Wintle in view of the fact that he has been closely connected with chemical matters in Bristol, and has been secretary of the local section of the Institute of Chemistry during the last eleven years.

MANCHESTER CITY COUNCIL is again offering a number of scholarships tenable in the faculty of technology of the University of Manchester. Successful candidates are required to follow a full-time course leading to the degree of Bachelor of Technical Science in the College of Technology, and matriculation or its equivalent is an essential qualification. For students who have been engaged in industry, and who have attended part-time day or evening classes, the scholarships are of the value of £100 per annum, while for students leaving secondary or central schools the value is £60. Both classes of scholarships are tenable for three years.

THE INSTITUTE OF METALS will give its twenty-third annual May lecture, to be delivered by Monsieur Albert Portevin (president of the Société des Ingénieurs Civils de France) on May 10, at 8 p.m. at the Institution of Mechanical Engineers, Storey's Gate, Westminster, London, S.W.1, the subject of the lecture being "Quenching and Tempering Phenomena in Alloys." Cards of invitation to the lecture (to be delivered in French, though English translations will be available at the meeting) may be obtained from Mr. G. Shaw Scott, 36 Victoria Street, London, S.W.1, together with membership application forms and particulars of the Institute's activities. An election of members is due to take place on the same day as the annual lecture, and persons then elected have the privilege of membership up to June 30, 1934.

New Companies Registered

Adastral Paints, Ltd., 26 Garden Road, Walton-on-Thames. Registered April 19. Nominal capital £100 in £1 shares. Objects: To acquire the registered trade mark "Adastral," and to carry on the business of manufacturers of cellulose, leadless impenetrable paint for all kinds of aircraft, motor bodies, etc. Directors: W. H. Kemp and Mrs. B. A. Kemp.

B. C. Fuels, Ltd. Registered April 13. Nominal capital £15,100. Objects: To acquire the benefit of certain existing inventions and secret information relating to artificial fuel and apparatus in connection therewith from A. A. Roberts; and to carry on the business of manufacturers of and dealers in artificial and patent fuel, and machinery, implements, appliances and commodities capable of being used in the manufacture thereof, and coke, coal, tar and all constituted bye-products thereof, and all chemicals and things employed in the manufacture of artificial and patent fuels; chemists, druggists, oil and colourmen, etc. Directors: Arthur A. Roberts, Mayfair Court, 46 Stratton Street, London, W.; and Henry C. Hay.

B. D. (Cellulose), Ltd., 173 Goswell Road, London, E.C.1. Registered April 13. Nominal capital £200 in £1 shares. Manufacturers of and dealers in cellulose products, etc. Directors: F. R. Kennington, and C. G. Benbow.

Earl Fitzwilliam's Royalties Co. Registered on April 19. Nominal capital £750,000 in £1 shares. The objects are to acquire any mines, mining rights and mineral, oleaginous, metalliferous and petroliferous land in the Counties of York, Nottingham and Derby or elsewhere, or to work, develop, and turn to account the same, and to carry on the business of colliery proprietors, mine and quarry owners, patent fuel, briquette and coke manufacturers, coal, peat and coke merchants and contractors, manufacturers of and dealers in sulphate of ammonia, benzol, petrol, pitch, tar, toluol, breeze, creosote, slack, naphtha, naphthalene and asphaltum, dye and colour makers, manufacturers of and dealers in explosives and munitions, gas makers, owners of gas plants, and coke ovens, generators of electricity, manufacturers of and dealers in chemicals and manures, shippers, dealers in oil, lime. Directors: Earl Fitzwilliam, Wentworth House, Rotherham and Viscount Milton.

Ebor Petroleum Company, Ltd. Registered April 10. Nominal capital £100 in £1 shares. Importers, distributors, manufacturers, sellers of and dealers in oil products of every description. The Directors are: Henry Eastwood, Holly Bank, Cadley, near Preston, and Wallace Miller, 170 Tulketh Road, Preston.

F. S. Bayley, Clanahan & Co., Ltd. Registered April 21. Nominal capital £2,000 in £1 shares. Objects: To acquire the business of a chemical merchant formerly carried on in Manchester by F. P. Bayley, as F. S. Bayley, Clanahan & Co. Directors: S. J. C. Mason, 84 Woodcote Grove Road, Coulsdon, Surrey, and J. F. A. Segner.

International Laboratories, Ltd., 28 Lincoln's Inn Fields, W.C.2. Registered April 18. Nominal capital £10,000 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, medicines, toilet requisites and preparations, etc. Directors: Fdk. S. G. Underwood, 36 Kent Road, East Molesey, and Henry J. H. D'Ath.

Joktan, Ltd., 4x Watson Street, Glasgow. Registered in Edinburgh on April 11. Nominal capital £2,000 in 1,500 ordinary shares of £1 and 10,000 deferred shares of 1s. each. Manufacturers, importers and exporters of, dealers in and agents for drugs, chemicals, synthetic preparations, etc.

Waterford Electrical and Chemical Works, Ltd. Registered in Dublin, March 27. Nominal capital, £2,500 in £1 shares. Manufacturers of, dealers in and agents for machinery, goods, apparatus and appliances for the production of electricity, etc. Subscribers: Philip Purcell, 13 Parnell Street, Waterford, M. Kennedy, and P. Flynn.

William Musgrave & Co., Ltd. Registered April 8. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in colours, paints, varnishes, lacquers, cellulose products and solvents, bituminous paints, oil and dry colours, etc. Directors: William Musgrave, 7 Kendal Road, Salford 6, and William A Jones, 37 Edmund Street, Seedley, Salford 6.

Corrosion Risks with Denatured Alcohol

FREQUENT reference has been made to the risk of hydrochloric acid development when carbon tetrachloride comes into contact with water, but the metal-corroding properties of alcohol denatured with this agent are not so well known. In a discussion in the "Chemiker-Zeitung," April 12, 1933, (page 285), Dr. W. Röhm draws attention to some recent evidence of the undesirability of employing carbon tetrachloride as a denaturant. It is pointed out, for example, that not only does this grade of alcohol cause injury to apparatus in the manufacture of medicinal chemicals, but the quality of the finished products suffers by comparison with those produced with the aid of pure alcohol.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Finland.—A reputable firm in Helsingfors is desirous of representing, on a commission basis, United Kingdom manufacturers of machinery of all kinds used in the paper, cellulose and pulp industries. (Ref. No. 598.)

Company News

British Tar Products.—An interim dividend of 6¼ per cent., less tax, is announced on both the preferred ordinary and the ordinary shares.

Broken Hill Proprietary Co., Ltd.—A half-yearly dividend of 1s. per share (Australian currency), is announced (5 per cent.) payable on May 24.

Newton Chambers & Co.—After allowing for depreciation, there is a profit of £40,825, making with balance brought in £58,743. A final dividend is to be paid on both classes of shares, of 5 per cent., making 7½ per cent., less tax, for the year, leaving to be carried forward £65,091.

Associated Dyers and Cleaners.—The directors announce that considerable loss has been made after taking into account results of subsidiary companies, and it will not be possible to pay any dividend on the preference capital for the half-year ending April 30, 1933. The board hope to be able to submit the report and accounts in time to hold the annual general meeting during May.

Rio Tinto Co., Ltd.—The net trading profit was £367,293 in 1932, which compares with £424,894 in 1931. With other income, the amount available is £494,627 against £511,018. The balance available for dividends is £58,516. The directors recommend the final dividend on the preference shares, leaving £380,568 to go forward, compared with £403,302 brought in. In 1931, £400,000 was transferred from reserve to meet delayed taxes. No ordinary dividend is proposed for 1932. The last was 20 per cent. in 1930.

Bryant & May, Ltd.—Final dividends are recommended at the rate of 4 per cent. on the ordinary shares, and of 5 per cent. on the partnership shares, both tax free. The following dividends are also recommended under the articles: Employees' proportion, £45,422; dividend on the ordinary shares, free of tax, £45,422; further dividend on the ordinary shares, free of tax, £152,578. The total distributed is thus £330,000, or 25 per cent., tax free, as in previous years. The directors further recommend the payment to ordinary shareholders of a bonus dividend of £150,000, being profit realised on the sale of investments.

Books Received

A Symposium on the Utilisation of Coal. London: The British Science Guild. Pp. 46. 1s.

British Chemical Abstracts. Index 1932. London: Bureau of Chemical Abstracts. Pp. 578.

Directory of Paper Makers, 1933. London: Marchant Singer & Co. Pp. 270. 5s. 6d.

Patents Explained. By Herbert J. W. Wildbore. London: H. J. W. Wildbore. Pp. 50. 5s.

Phase Rule Studies. By J. E. Wynfield Rhodes. London: Humphrey Milford. Pp. 128. 6s.

Transactions of the American Institute of Chemical Engineers. Vol. XXVII. 1931. New York: D. Van Nostrand Co., Inc. Pp. 426.

Official Publications

Economic Conditions in Hungary, 1930-32. Report by Dr. H. C. A. Carpenter. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 62. 2s.

Economic Conditions in Japan to December 31, 1932. Report by G. B. Sansom and D. W. Kermode. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 132. 3s. 6d.

Economic Conditions in Spain, January, 1933. Report by Alexander Adams. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 68. 2s.

Hints for Commercial Visitors to Brazil. Department of Overseas Trade.

Report on the Economic Situation in Finland at the Beginning of 1933. Department of Overseas Trade.

The Purification of Waste Waters from Beet Sugar Factories. Department of Scientific and Industrial Research. Water Pollution Research Technical Paper No. 3. London: H.M. Stationery Office. Pp. 158. 7s. 6d.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to May 5, 1933.

Charter. 539,485. Class 1. Chemical substances used in manufactures, photography or philosophical research, but not including varnishes and paints and not including any goods of a like kind to any of these excluded goods. The General Chemical and Pharmaceutical Co., Ltd., Judex Works, Harrow Road, Sudbury, Wembley, Middlesex. February 28, 1933.

Mosstine. 538,458. Class 2. Chemical substances used for agricultural, horticultural, veterinary and sanitary purposes. The firm trading as David Ramsay & Son, High Street, Uffculme, Devonshire. January 20, 1933.

Opposition to the registration of the following trade marks can be lodged up to May 12, 1933.

Noricene. 536,849. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. British Dyestuffs Corporation, Ltd., Hexagon House, Blackley, Manchester. November 22, 1932. (By consent).

Alloprene. 539,739. Class 4. Raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures, not included in other classes. Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1. March 9, 1933.

Opposition to the registration of the following trade mark can be lodged up to May 19, 1933.

Coffinex. 539,825. Class 4. Bitumen, raw or partly prepared, for use in manufactures. The Graphite Oils Co., Ltd., Victoria Street, Grimsby, Lincolnshire. March 11, 1933.

Forthcoming Events

May 1.—Society of Chemical Industry (London Section). "Ageing and Age-Hardening in Metals." Professor C. H. Desch. 8 p.m. Burlington House, London.

May 1.—Royal Institution. Annual meeting. 5 p.m. 21 Albemarle Street, London.

May 3.—Society of Public Analysts. "An Investigation of Solanine Poisoning," S. G. Willimott; "The Examination of Leather for the Presence of Extractable Chromium Compounds," F. E. Humphreys and H. Phillips; "Barium as a Normal Constituent of Brazil Nuts," W. M. Seaber; "Use of the Phytosteryl Acetate Test in the Routine Examination of Butter Fats," Herbert Hawley. 8 p.m. Burlington House, London.

May 3.—Business Research and Management Association of Great Britain. "Effective Manufacturer and Dealer Co-operation." E. D. A. Herbert. 6.45 p.m. Anderton's Hotel, Fleet Street, London.

May 4.—The Chemical Society. Papers by I. M. Heilbron, A. L. Morrison and J. C. E. Simpson, E. B. Maxted and G. J. Lewis, E. D. Hughes and C. K. Ingold, E. D. Hughes, C. K. Ingold and C. S. Patel, L. Hey and C. K. Ingold. 8 p.m. Burlington House, London.

May 5.—Institute of Chemistry (Belfast and District Section). Annual meeting. 7.45 p.m. Physics Lecture Theatre of the Royal Belfast Academical Institution.

May 5.—The Physical Society. 5 p.m. Imperial College of Science, South Kensington.

May 6.—The Ceramic Society. Spring meeting. Joint meeting of all sections. "The Constitution of Coal." Dr. F. V. Tideswell. Discussion on the "Winning and Transport of the Raw Materials used in the Ceramic Industries," opened by F. West. "The Permeability to Air and Water of Heavy Clay Products." F. H. Clews and A. T. Green. 10 a.m. St. Annes.

ADVERTISERS please note that the latest hour at which we can accept advertisements for insertion in these columns each week is 10 o'clock on Thursday morning.

APPOINTMENTS WANTED

(Prepaid—Twenty-seven words 1s. 6d.; every additional nine words 6d.) Replies can be received "Box , Office of this Journal," in which case our address is included in cost of advertisement, and charged as nine words.

BOYS of good character, well-trained and eager to work, will be gladly recommended by the Warden of the John Benn Hostel, Bower Street, E.1.

FOR SALE

(1s. per line; minimum charge 3s. Sixpence extra is charged when replies are addressed to Box Numbers.)

BROUGH'S Patent Indestructible Drums and Kegs, also Plain Welded, Double-seamed or Corrugated Drums and Kegs, of every description, from 1 to 80 gallon.—4 Upper Parliament Street, Liverpool. Telephone: Royal 2685. Telegrams: Superdrum, Liverpool.

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill Jones Pop., London." Telephone: 3633 East.

'Phone 98 STAINES.

COPPER MIXING PAN 3 ft. x 2 ft. deep; Manlove Alliott Lard Cooling Machine; 1,500 gallon Enclosed Copper Tank; Werner Mixer, Pan 3 ft. 9 in. x 3 ft. 3 in. x 2 ft. 7 in.; Steam Heated Oven; Small Filter Press.
HARRY H. GARDAM AND CO., LIMITED, STAINES.

HYDRAULIC PRESSES AND PUMPS. Large stock in London. Price quoted for adapting and erecting.—THOMPSON AND SON, Maria Street, Millwall.

MIXERS by Werner and other makers, jacketed pans, disintegrators, grinders, good stock.—C. F. DAVIS, LTD., Hatcham Road, Old Kent Road, London, S.E.15.

TO DYERS and Artificial Silk Manufacturers.—Special Yarn Poles for Cotton, Wool and Silk Dyers, also Stove Poles, Dye Boxes, Bobbins, Rollers, Bogies, Yarn Barrows, etc. Special Lancewood Poles and Canes, superfine finish for Mercerisers. Prices on application. CRAWFORD'S TURNING MILLS, Paisley, Scotland.

WANTED

(1s. per line; minimum charge 3s. Sixpence extra is charged when replies are addressed to Box Numbers.)

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Pop., London." Telephone: 3633 East.

WANTED—Gardner Sifter and Mixer, 300 lb. capacity. Full particulars and lowest price to Box No. 1479, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

EDWARD RUSHTON, SON AND KENYON (Established 1855).
Auctioners' Valuers and Fire Loss Assessors of
CHEMICAL WORKS, PLANT AND MACHINERY
York House, 12 York Street, Manchester.
Telephone: 2517 and 2518 Central, Manchester.
Telegrams: "Russonken, Manchester."

PATENTS & TRADE MARKS

(1s. per line; minimum charge 3s.)

KINGS PATENT AGENCY, LTD. (B. T. King, Registered Patent Agent, G.B., U.S., and Can.), 146a Queen Victoria Street, London, E.C.4. "Advice Handbook," and Cons. free; 47 years' ref. 'Phone: Central 0682.

ADVICE on Protection of Inventions and Registration of Trade Marks. Send for free booklets. REGINALD W. BARKER AND CO., Patent Agents, 56 Ludgate Hill, E.C.4. (Estab. 46 years.) Telephone: Central, 1882.

PATENTS obtained, trade marks and designs registered, at home and abroad.—GEE AND CO (Patent and Trade Mark advisers to THE CHEMICAL AGE), 51-52 Chancery Lane, London, W.C.2. Telephone: Holborn 1525. Established 1905.